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EXECUTIVE SUMMARY

In 1991, National Marine Fisheries Service (NMFS) research addressed three areas related to smolt transportation. The first was an ongoing evaluation of smolt transportation from Lower Granite and McNary Dams. The second was a pilot study to examine the feasibility of using passive integrated transponder (PIT) tags to evaluate transportation of wild spring/summer chinook salmon. The third and final area was an evaluation of the PIT-tag detection/diversion system at Lower Granite Dam.

1. Transportation Studies

Drought conditions in the Snake River Basin again precluded marking of spring/summer chinook salmon and steelhead smolts for the final year of a 3-year reevaluation of transportation from Lower Granite Dam. Marking of juvenile fall and spring/summer chinook salmon for a similar 3-year study at McNary Dam was completed in 1988.

Adult recovery efforts continued for the above studies and for groups of smolts marked for the transport index at Lower Granite Dam in the 1987 and 1990 drought years. Adult returns of spring/summer chinook salmon and steelhead for the 1987 barge transport index are now complete. Returns for spring/summer chinook salmon were similar to returns for other marked and transported groups of the same stock in recent years. For steelhead, adult returns were similar to returns for recent years even though low flows and warm water in the Snake River in fall 1988 likely reduced the return of 1-ocean adults. Few adults of either species have returned from the

transport and control groups marked at Lower Granite Dam in 1989, probably as a result of poor ocean survival. However, returns are higher for the transported groups of both species.

For the McNary Dam studies, adult returns of transport and control groups of spring/summer chinook salmon marked in 1987 are complete. More adults from transported than control groups were recovered at all sample locations, but the results were inconclusive due to insufficient adult returns. Adult returns for the 1988 study year are incomplete, but the preliminary return rates are similar to those of the 1987 study. For fall chinook salmon, returns of transport and control groups marked from 1986-88 are incomplete. So far, returns for all study years to all locations strongly favor the transported groups.

2. Pilot Study of PIT Tag Feasibility in Transportation Studies

We completed the final year of a 3-year pilot study to examine the feasibility of utilizing PIT tags to evaluate transportation of wild yearling chinook salmon smolts in the Snake River. These fish were PIT tagged as parr in their natal streams during the summer of 1990 and intercepted as smolts the following spring at the collector dams for the transportation program. Hatchery fish were also included in the study. As during the previous 2 years, mortalities associated with the collection and tagging of wild fish were exceptionally low. Recovery rates for these fish at the dams the following spring were improved over those of the previous 2 years, but were still lower than originally expected. The outmigration timing was later than during the previous 2 years for all wild stocks, but similar to the previous 2 years for hatchery stocks. As

during the previous 2 years, outmigration periods for wild fish from individual streams were protracted and highly variable within and among years. In all years, hatchery stock migration periods were compressed and consistent.

3. Assessment of PIT-tag Detection/Diversion System

We completed the third year of evaluation of a PIT-tag detection/diversion system at Lower Granite Dam. Recommended modifications to the system, based on results from the previous 2 years of evaluation, produced the desired results. The efficiency of the system varied proportionally to the facility counts. When facility counts were below 5,000 fish per hour, 0.43 untagged fish were diverted per PIT-tag diversion cycle. When the facility counts were between 30,000 and 35,000 fish per hour, 3.19 untagged fish were diverted per cycle. In contrast to previous results, the abundance of steelhead in the system appeared to have no influence on the efficiency of the system. These results indicate that the system is ready for use in monitoring or research programs.

TRANSPORTATION STUDIES, LOWER GRANITE AND MCNARY DAMS

Introduction

To index the relative success of the barge transportation program conducted annually since 1981 by the U.S. Army Corps of Engineers (COE), spring/summer chinook salmon smolts were marked at Lower Granite Dam in 1983, 1984, and 1985 and steelhead smolts were marked in 1984 and 1985. No paired control groups of either species were marked during any of the above years. The 1985 smolt marking operations were conducted by the Fish Passage Center (formerly the Water Budget Center). Therefore, data on these releases were not included in any of the National Marine Fisheries Service (NMFS) annual reports. Final adult returns for the 1983 and 1984 study years were reported in Harmon et al. (1989), and final adult returns for the 1985 study year were reported in Matthews et al. (1990). By 1985, preliminary adult returns from these marking efforts indicated that survival of marked/transported smolts had improved considerably compared to returns from the 1976-80 study years (Park et al. 1986). We believe a combination of factors is responsible for the observed increase in smolt to adult survival. These factors include, but may not be limited to, major improvements in transport collection facilities, improved fish quality, and greatly improved fish handling/marking techniques.

In 1986, a new 3-year transportation study was initiated on spring/summer chinook salmon and steelhead at Lower Granite Dam and spring/summer and fall chinook salmon at McNary Dam. The primary goal of the study was to reevaluate transportation of smolts around dams utilizing state of the art collection/transport and

handling/marking techniques. At McNary Dam, we marked transport and control groups of spring/summer and fall chinook salmon for three consecutive years (1986-88). At Lower Granite Dam, we marked transport and control groups of spring/summer chinook salmon and steelhead in 1986. However, drought conditions caused low river flows and interrupted the marking schedule in 1987, 1988, 1990, and 1991. We marked transport and control groups of both species in 1986 and 1989. In 1987 and 1990, we marked barge transport groups for indexing of both species. No marking was done in 1988 and 1991 due to the prolonged drought. Recovery of adults for most of these marking efforts is incomplete. However, adult returns for the 1986 study year at Lower Granite Dam are complete and were reported by Matthews et al. (1992).

To determine the hatchery/wild composition of the Snake River spring/summer chinook salmon population, NMFS and the Oregon Department of Fish and Wildlife began a study to examine scales on smolts and returning adults. In particular, the study was intended to examine the hatchery/wild composition of each marked group of smolts for the transportation study and, subsequently, to examine the scales of those returning as adults. Since drought conditions precluded marking of smolts for the 1991 study year, we sampled scales from adults returning from previous marking efforts and from the general population. Results of this effort are reported in Appendix 2 of this report.

Methods

General

Smolts at both dams were marked with CWTs and freeze brands during each year's outmigration, and either transported by barge for release below Bonneville Dam or released as controls below Little Goose or McNary Dams. Matthews et al. (1987) provides details on juvenile marking procedures.

Recovery of Adults and Data Analysis

Adults were recovered in each of 3 to 6 years (depending upon species and study site) following release as juveniles. Traps in fish ladders at Lower Granite and Priest Rapids Dams (for McNary Dam releases) were the primary recovery sites for spring/summer chinook salmon and steelhead. Ocean and river commercial fisheries were primary recovery sites for fall chinook salmon marked at McNary Dam. If recoveries were sufficient, trapping efficiencies were estimated for individual release lots by comparing the number of marked fish identified in a fish ladder trap to the total number of marked fish returning to the hatcheries and, when available, to tributary sport fisheries and natal spawning areas.

Evaluation of transportation was based upon recovery rates of adults and associated transport/control ratios (T/C) from fish marked as juveniles. A 95% confidence interval (CI) was used to test the null hypothesis: That the true transport to control ratio was equal to one (1). If the 95% CI did not include a ratio equal to one (1), then the null hypothesis was rejected. Beginning at Lower Granite Dam in 1989, the study design was adjusted to test a

T/C of 1.5 with a coefficient of variation of 10% for spring/summer chinook salmon and 7.5% for steelhead.

To normalize the distribution, the ratios were log transformed prior to CI construction. The endpoints of the CI were then back transformed to provide a nonsymmetric CI on the original scale. For analysis using total recoveries, the CI was calculated using both theoretical and empirical estimates of variance. The CI employing the empirical variance estimate was preferred.

The 95% CI using transformed data based on theoretical variance was:

$$\ln(T/C) \pm 1.96\sqrt{\frac{1}{n_t}+\frac{1}{n_c}-\frac{1}{N_t}-\frac{1}{N_c}}$$

The 95% CI back transformed to the original scale was:

$$\left(e^{\ln(T/C) - 1.96\sqrt{\frac{1}{n_t}+\frac{1}{n_c}-\frac{1}{N_t}-\frac{1}{N_c}}}, e^{\ln(T/C) + 1.96\sqrt{\frac{1}{n_t}+\frac{1}{n_c}-\frac{1}{N_t}-\frac{1}{N_c}}} \right)$$

The 95% CI using transformed data based on empirical variance was:

$$\ln(T/C) \pm t_{0.05}{}^{n-1}\ S.E.(\ln(T/C))$$

The 95% CI back transformed to the original scale was:

$$\left(e^{\ln(T/C) - t_{0.05}^{n-1} S.E.(\ln(T/C))} , e^{\ln(T/C) + t_{0.05}^{n-1} S.E.(\ln(T/C))} \right)$$

where,

T/C = overall transport recovery percentage divided by overall control recovery percentage

$S.E.$ = standard deviation of the r replicate ln(T/C)'s divided by $r^{1/2}$

n_t = total of transport recoveries

n_c = total of control recoveries

N_t = total of transport releases

N_c = total of control releases

t = the t probability for a two-sided significance level α=0.05 and n-1 degrees of freedom

1.96 = the normal probability for a two-sided α = 0.05

Results and Discussion

Adult Recoveries for Lower Granite Dam Studies

Spring/summer chinook salmon--Adult recoveries from 1987 Lower Granite Dam smolt releases of the barge transport index group are complete (Table 1 and Appendix Tables 1.0 through 1.11). We recovered 91 fish at Lower Granite Dam (0.18% of releases) and 118 fish at all recovery sites combined (0.24% of releases). These adult returns are similar to the returns of marked groups of smolts transported by barge from the dam in 1984, 1985, and 1986, when observed adult returns at the dam ranged between 0.16 and 0.22% of the smolt releases.

Table 1.--Summary of recovered adult spring/summer chinook salmon marked as juveniles at Lower Granite Dam in 1987 and transported to below Bonneville Dam by barge (recoveries through July 1991). Numbers in parentheses represent adults that were jaw tagged at the dam and subsequently recovered upstream.

Number released	Ocean-age	Observed adult returns									
		Ocean fishery	Bonneville Dam	Indian fishery	River fishery	Lower Granite Dam N	Lower Granite Dam %	Hatcheries	Stream surveys	Total N	Total %
50,207	1	2	0	0	1	12 (1)	0.02	0	0	14	0.03
	2	0	9 (5)	2	1	66 (19)	0.13	35	0	89	0.18
	3	0	1 (1)	2	0	13 (2)	0.03	1	1	15	0.03
	Total	2	10 (6)	4	2	91 (22)	0.18	36	1	118	0.24

Recoveries of adults from transport and control groups of smolts marked at Lower Granite Dam in 1989 are preliminary (Table 2 and Appendix Tables 2.0 through 3.12). To date, returns to Lower Granite Dam are much lower than expected with 26 (0.03% of releases) transports and 17 (0.02% of releases) controls. These recoveries include 1- and 2-ocean returns with 3-ocean fish due to return in spring 1992. Adult returns to the Snake River from the 1989 smolt outmigration were also poor for general populations of both spring/summer chinook salmon and steelhead. Therefore, we are unsure if the addition of 3-ocean recoveries will provide sufficient adult return information to provide a precise T/C estimate for this study year.

During spring 1990, an unusually high occurrence of teeth marks, resulting from attacks by marine mammals, was documented on spring/summer chinook salmon at Lower Granite Dam (Matthews et al. 1992). In spring 1991, we collected data on 1,325 returning spring/summer chinook salmon throughout the adult migration (Table 3). Overall incidence of marine mammal teeth marks was 14.0% (7.4% descaled and 6.6% flesh wounds) for 1991 as compared to 19.2% for a similar period during the previous year. Highest incidence occurred during the early portion of the migration and tapered off as the migration progressed. Impacts by marine mammals may further jeopardize salmon stocks already at low levels of abundance.

Steelhead--Adult returns for steelhead marked as smolts and released in 1987 as a barge transport index are complete (Table 4 and Appendix Tables 4.0 through 4.7). The total adult return from all age classes to the dam was 500 fish or 1.82% of the release.

Table 2.--Preliminary summary of recovered adult spring/summer chinook salmon marked as juveniles at Lower Granite Dam in 1989 (recoveries through July 1991). Controls were released below Little Goose Dam. Numbers in parentheses represent adults that were jaw tagged at the dam and subsequently recovered upstream.

Groups	Number released	Ocean-age	Observed adult returns: Ocean fishery	Bonneville Dam	River fishery	Indian fishery	L. Granite Dam N	L. Granite Dam %	Hatcheries	Stream surveys	Total N	Total %
1989 Transport	75,295	1	0	0	0	0	3	0.00	1	0	4	0.01
		2	0	3	0	0	23	0.03	0	0	26	0.03
		Total	0	3	0	0	26	0.03	1	0	30	0.04
1989 Control	107,176	1	0	1	0	0	2 (1)	0.00	1	0	3	0.00
		2	0	1	0	0	15	0.01	0	0	16	0.01
		Total	0	2	0	0	17 (1)	0.02	1	0	19	0.02

Table 3.--Weekly incidence of marine mammal marks on adult spring/summer chinook at Lower Granite Dam, 1991.

Date	Sample size (N)	Incidence (%)
19-27 April	4	0
28 April-4 May	20	15.0
5-11 May	102	24.5
12-18 May	88	25.0
19-25 May	113	15.0
26 May-1 June	98	23.1
2-8 June	106	20.8
9-15 June	116	9.5
16-22 June	138	15.9
23-29 June	179	8.9
30 June-6 July	163	8.0
7-13 July	121	7.4
14-20 July	60	5.0
21-23 July	17	5.9
Total	1,325	14.0

Table 4.--Summary of recovered adult steelhead marked as juveniles at Lower Granite Dam in 1987 and transported to below Bonneville Dam by barge (recoveries through July 1991). Numbers in parentheses represent adults that were jaw tagged at the dam and subsequently recovered upstream.

Number released	Ocean-age	Observed adult returns							
		Bonneville Dam	Indian fishery	River fishery	Lower Granite Dam N	Lower Granite Dam %	Hatcheries	Total N	Total %
27,544	1	10 (6)	0	25	103 (31)	0.37	6	107	0.39
	2	0	3	105	389 (153)	1.41	56	400	1.45
	3	0	0	2	8 (3)	0.03	2	9	0.03
	Total	10 (6)	3	132	500 (187)	1.82	64	516	1.87

However, nearly four times as many fish were recovered at the dam as 2-ocean fish in 1989 than as 1-ocean fish in 1988 (1.41 vs 0.37%, respectively). Normally, we would expect to recover nearly as many 1- as 2-ocean adults from a given smolt outmigration. It appears that 1-ocean adults encountered unfavorable conditions in the form of low river flows and high water temperatures while migrating upstream in fall 1988 (Matthews et al. 1992). These conditions likely caused delays in migration and high mortality in migrating adults of this age class. Conversely, 2-ocean adults returning in 1989 encountered higher flows and lower water temperatures, resulting in much improved returns. Similar differences were identified with returning adult steelhead marked in studies conducted during 1984-86 (Harmon et al. 1989, Matthews et al. 1990).

Adult returns of steelhead smolts marked for transportation research in 1989 are preliminary, as only 1-ocean adults have returned to date (Table 5 and Appendix Tables 5.0 through 6.5). Unfortunately, the preliminary returns are exceptionally poor. Only 33 adults (0.11% of the release) that were transported by barge and 34 adults (0.08% of the release) that were released as inriver controls returned to the dam as 1-ocean fish. The overall return of adults (56,979) in the general population at Lower Granite Dam in fall 1990 and spring 1991 was also low. Further, these returns were predominated by 2-ocean adults from the 1988 smolt outmigration, indicating a very poor return of 1-ocean fish from the 1989 outmigration. A similar pattern was observed for spring/summer chinook salmon from the 1989 smolt outmigration. Since river flows in spring 1989 were the highest of the past 5 years (1987-91) and

Table 5.--Preliminary summary of recovered adult steelhead marked as juveniles at Lower Granite Dam in 1989 (recoveries through July 1991). Controls were released below Little Goose Dam. Numbers in parentheses represent adults that were jaw tagged at the dam and subsequently recovered upstream.

			Observed adult returns							
						Lower Granite Dam			Total	
Groups	Number released	Ocean-age	Bonneville Dam	Indian fishery	River fishery	N	%	Hatcheries	N	%
1989 Transport	30,116	1	0	2	3	33 (3)	0.11	0	35	0.12
1989 Control	42,259	1	1	2	3	34 (4)	0.08	1	37	0.09

only slightly below average for the past 20 years, survival in the estuary or ocean was presumably poor for 1989 outmigrants, regardless of transportation.

Adult Recoveries for McNary Dam Studies

Spring chinook salmon--Adult recovery efforts for transportation studies conducted at McNary Dam from 1986 through 1988 continue. Final returns for the 1986 study year were reported (Matthews et al. 1992) and were so few as to preclude statistical analysis. Recoveries from 1987 releases are complete, while additional recoveries from 1988 releases are expected in the coming months.

Adult returns for the 1987 study year, while poor, were improved over returns for the 1986 study year (Table 6 and Appendix Tables 7.0 through 8.8). Due to low recovery numbers, we calculated only theoretical CIs for the T/C estimates based on adult recoveries at Bonneville and Priest Rapids Dams, in the river commercial and Indian fisheries, and at hatcheries (Table 7). Both theoretical and emperical CIs were constructed for total combined recoveries. The T/Cs (95% CIs) ranged from 1.11 (0.56, 2.21) at Bonneville Dam to 7.50 (2.17, 25.89) in the river commercial fishery. Again, the imprecise results were due to the small numbers of adult recoveries. While the overall T/C of 1.63 indicated a benefit from transportation, the lower CI limit overlapped 1.00.

In summary, results of the 1987 study suggest a positive association between transportation and survival of spring chinook salmon from McNary Dam. However, confidence values around the T/C estimate were large. Therefore, any future testing should include

Table 6. --Preliminary summary of adult recoveries of spring/summer chinook salmon marked as juveniles at McNary Dam in 1987 and 1988 (recoveries through July 1991).

Test groups	Number released	Ocean-age	Observed adult returns: Ocean fishery	Bonneville Dam	River fishery	Indian fishery	L. Granite Dam	Priest Rapids Dam	Hatcheries	Stream surveys	Total N	Total %
1987												
Transport	38,487	1	1	1	5	0	0	0	1	0	8	0.02
		2	0	11 (7)	5	3	4 (1)	17 (5)	10	2	39	0.10
		3	1	2	5	4	2	4 (2)	13	0	29	0.08
		Total	2	14 (7)	15	7	6 (1)	21 (7)	24	2	76	0.20
1987												
Control	57,902	1	0	1	1	0	1	0	0	0	3	0.01
		2	1	17 (5)	2	7	6 (3)	11 (1)	14	1	50	0.09
		3	1	1	0	3	0	6 (1)	3	2	15	0.02
		Total	2	19 (5)	3	10	7 (3)	17 (2)	17	3	68	0.12
1988												
Transport	50,028	1	0	2	0	0	3	0	1	0	6	0.01
		2	0	17 (3)	6	3	5 (3)	10 (2)	11	1	45	0.09
		3	0	2	0	0	2	0	0	0	4	0.01
		Total	0	21 (3)	6	3	10 (3)	10 (2)	12	1	55	0.11
1988												
Control	75,036	1	0	1	0	0	1	1	1	0	4	0.01
		2	0	23 (5)	5	4	6	14 (2)	7	0	52	0.07
		3	0	5	0	0	1	0	0	0	6	0.01
		Total	0	29 (5)	5	4	8	15 (2)	8	0	62	0.08

Numbers in parentheses are fish that were subsequently recaptured.

Table 7.--Summary of T/Cs and 95% CIs for adult recoveries of spring chinook salmon marked as smolts at McNary Dam in 1987.

Recovery site	T/C	Theoretical 95% CI	Empirical 95% CI
Bonneville Dam	1.11	(0.56, 2.21)	[a]
Priest Rapids Dam	1.88	(0.98, 3.52)	[a]
River fishery	7.50	(2.17, 25.89)	[a]
Indian fishery	1.05	(0.40, 2.77)	[a]
Hatcheries	2.12	(1.14, 3.95)	[a]
Combined	1.63	(1.18, 2.25)	(0.57, 4.63)

[a] Too few adult recoveries to estimate

greatly increased numbers of marked smolts to provide adequate adult recoveries for precise and conclusive results.

Adult returns from smolts marked at McNary Dam in 1988 are similar to the returns for 1987 study year (Table 6 and Appendix Tables 9.0 through 10.10). Recoveries are quite low so far, and when complete, it is likely the results will be comparable to the 1987 study. A total of 55 transport (0.11% of releases) and 62 control (0.08% of releases) returns have been documented to all recovery sites combined so far.

Fall chinook salmon--Adult returns from transport and control releases of juveniles marked at McNary Dam from 1986 through 1988 were monitored at Bonneville Dam, in the ocean, river, tribal fisheries, and at hatcheries. Returns to date are incomplete, but existing data are shown in Table 8 and Appendix Tables 11.0 through 16.5.

Preliminary recoveries of 1- to 4-ocean age adults from 1986 releases indicate substantial benefits for transported fish. A total of 416 transports (0.36% of the releases) and 159 controls (0.14% of the releases) have been recovered, resulting in a T/C of 2.60. As expected, most recoveries were from the ocean fisheries with substantial numbers recovered from the tribal fishery, as well as from hatcheries and at Bonneville Dam. We expect to recover a few 5-ocean adults next year in addition to receiving late data from the various fisheries.

Preliminary percentage returns of adults from 1987 marked fish are higher than for the 1986 study year for the same recovery period (Table 8). As with the 1986 releases, most recoveries have come

Table 8. --Preliminary summary of adult recoveries of fall chinook salmon marked as juveniles at McNary Dam from 1986 to 1988 (recoveries through July 1991).

Test groups	Number released	Ocean-age	Observed adult returns: Ocean fishery	Bonneville Dam		River fishery	Indian fishery	Hatcheries	Stream surveys	Total N	Total %
1986											
Transport	114,653	1	2	0		6	0	8	0	16	0.01
		2	28	4		2	0	9	0	43	0.04
		3	42	0		17	36	27	4	126	0.11
		4	84	56	(16)	22	69	15	1	231	0.20
		Total	156	60	(16)	47	105	59	5	416	0.36
1986											
Control	115,991	1	1	0		1	0	3	1	6	0.00
		2	11	4		0	0	8	0	23	0.02
		3	24	0		9	16	18	0	67	0.06
		4	20	11	(3)	4	19	12	0	63	0.05
		Total	56	15	(3)	14	35	41	1	159	0.14
1987											
Transport	68,376	1	8	24		1	0	6	0	39	0.06
		2	12	0		6	7	8	2	35	0.05
		3	65	38	(12)	12	49	8	1	161	0.24
		Total	85	62	(12)	19	56	22	3	235	0.34
1987											
Control	68,291	1	4	8		1	0	4	0	17	0.02
		2	2	0		0	1	4	0	7	0.01
		3	16	17	(7)	3	14	6	0	49	0.07
		Total	22	25	(7)	4	15	14	0	73	0.11
1988											
Transport	60,013	1	1	0		1	0	1	0	3	0.00
		2	5	3	(1)	0	1	0	0	8	0.01
		Total	6	3	(1)	1	1	1	0	11	0.02
1988											
Control	60,010	1	0	0		0	0	1	0	1	0.00
		2	2	2		1	2	0	0	7	0.01
		Total	2	2		1	2	1	0	8	0.01

Numbers in paranetheses are fish that were subsequently recaptured.

from the ocean fisheries. Furthermore, the overall T/C of 3.00 is higher than for the 1986 fish. Additional recoveries are expected in ensuing years.

Adult returns from 1988 juvenile releases are few to date, with only 11 transport and 8 control fish recaptured (Table 8). Many additional returns are expected within the next few years.

PILOT STUDY TO EXAMINE THE FEASIBILITY OF USING PIT TAGS TO EVALUATE TRANSPORTATION OF WILD CHINOOK SALMON SMOLTS

Introduction

The NMFS and COE conducted pilot studies in the summers of 1988 and 1989 with the primary objective of examining the feasibility of using PIT tags to evaluate transportation of yearling chinook salmon smolts. Both wild and hatchery-reared fish were included in these studies. During the first 2 years, we developed effective techniques for collecting and PIT tagging large numbers of wild parr in their natal streams with low mortality rates, observed detection rates much lower than expected for all PIT-tagged fish upon their arrival the following spring at the three collector dams, and determined that outmigration timing of yearling chinook salmon smolts through Lower Granite Dam differs considerably between hatchery and wild fish.

In the summer of 1990, we began the third and final year of the pilot study. As in 1989, PIT tagging in 1990 was concentrated in the Middle Fork of the Salmon River drainage; a primary production area for wild spring chinook salmon in Idaho. Here we report the

results of the third year of the pilot study and summarize the outmigration timing results for all 3 years.

Methods

Wild Fish

During August and September 1990, we collected and PIT tagged wild spring/summer chinook salmon parr in nine streams in Idaho and three streams in Oregon (Fig. 1). Specific streams for tagging wild spring chinook salmon parr were chosen in the following areas: Bear Valley Creek, Elk Creek, Cape Horn Creek, Marsh Creek, Big Creek in the Middle Fork of the Salmon River drainage; Valley Creek and East Fork of the Salmon River in the upper Salmon River drainage; and Catherine Creek and the Lostine River in Oregon. Wild summer chinook salmon parr were tagged in the Secesh and South Fork of the Salmon Rivers in Idaho, and the Imnaha River in Oregon.

Fish were collected and tagged from various reaches of each stream. Collecting and PIT tagging procedures described by Matthews et al. (1990) remained the same for our field work in 1990.

Over the course of the 3-year study, wild parr were PIT-tagged in many streams in Idaho and Oregon (Table 9). We developed a systematic comparison of the overall outmigration timing differences among the 3 years at Lower Granite Dam by combining the recoveries of individual streams for each year.

Hatchery Fish

PIT-tagged spring chinook salmon from Dworshak and Sawtooth Hatcheries and summer chinook salmon from McCall Hatchery were compared to wild fish. Dworshak and Sawtooth Hatchery fish were

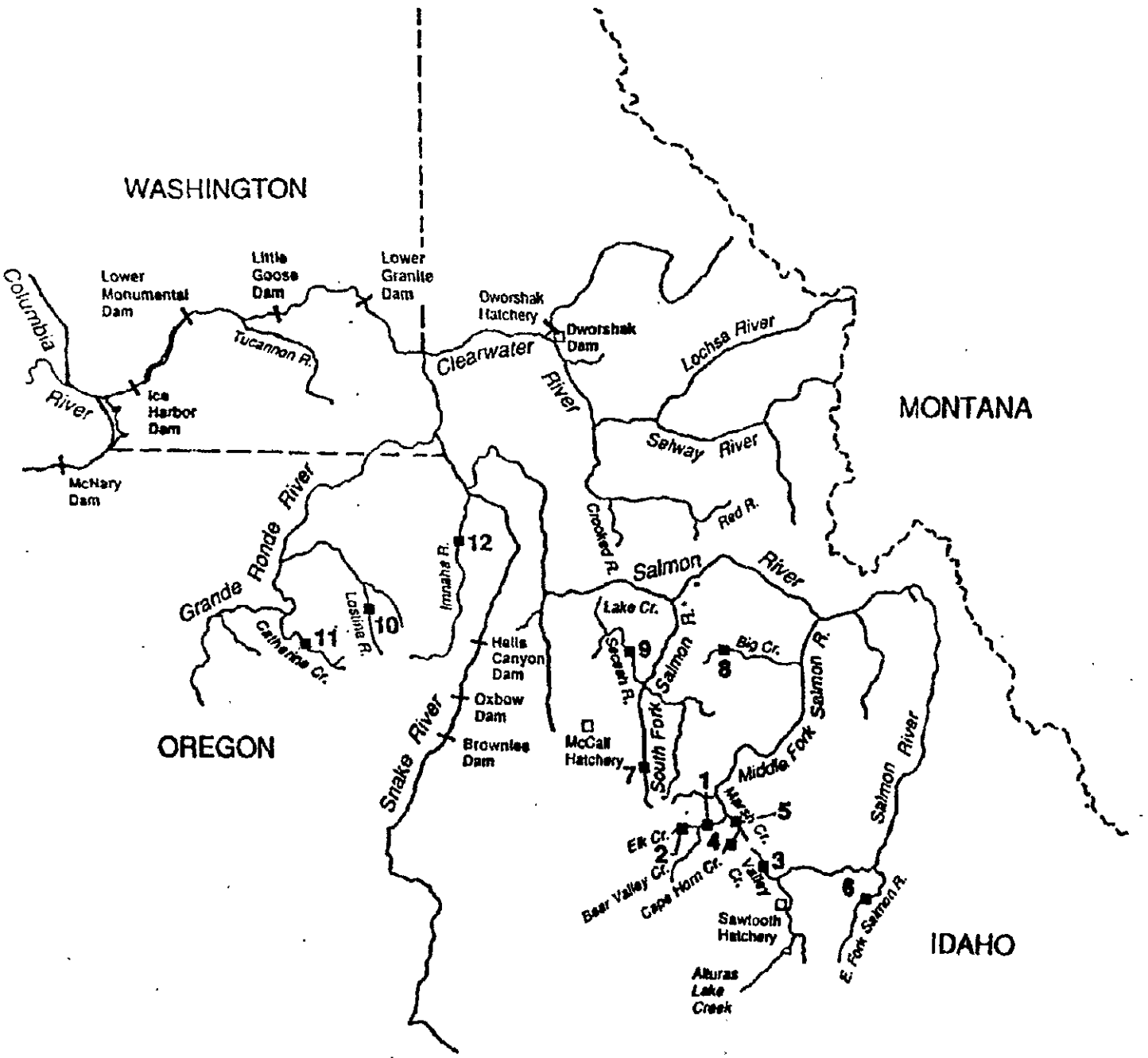


Figure 1.--Study area where wild spring/summer chinook salmon were PIT tagged; numbers indicate the sequence of tagging.

Table 9.--History of PIT tagging wild and hatchery spring/summer chinook salmon in Idaho and Oregon, 1988, 1989, and 1990.

	1988	1989	1990
	Wild spring chinook salmon		
Crooked River	x		
Red River	x		
East Fork Salmon River	x		x
Upper Salmon River	x		
Alturas Lake Creek	x	x	
Valley Creek	x	x	x
Sulphur Creek		x	
Elk Creek		x	x
Bear Valley Creek		x	x
Marsh Creek		x	x
Cape Horn Creek			x
Big Creek		x	x
Lostine River		x	x
Catherine Creek			x
Grande Ronde River	x		
	Hatchery spring chinook salmon		
Lookingglass Creek Hatchery	x		
Sawtooth Hatchery	x	x	x
Dworshak Hatchery		x	x
	Wild summer chinook salmon		
Secesh River	x	x	x
Lake Creek	x		
South Fork Salmon River	x		x
Imnaha River	x	x	x
	Hatchery summer chinook salmon		
McCall Hatchery	x		x

tagged by NMFS personnel for a pilot study by the U.S. Fish and Wildlife Service (USFW) to examine the relationship between bacterial kidney disease (BKD) and smolt transportation. The USFWS will report procedures and recovery percentages at dams for their study fish in a separate document. McCall Hatchery fish were PIT tagged by the Idaho Department of Fish and Game (IDFG).

Fish from several different hatcheries were PIT tagged over the course of this 3-year study (Table 9). We combined all hatchery recoveries for individual years to provide a comparison of the outmigration timing of hatchery fish among the 3 years of study.

Monitoring PIT Tags at Dams

During spring 1991, surviving spring/summer chinook salmon, PIT tagged for this study in summer 1990, migrated downstream volitionally through the hydroelectric complex on the Snake and Columbia Rivers. Of the eight dams the smolts pass, three are equipped with complete smolt collection and PIT-tag monitoring systems. These are Lower Granite and Little Goose Dams on the Snake River and McNary Dam on the Columbia River (Fig. 1). These dams also serve as the collection points for the smolt transportation program.

At these facilities, all collected smolts that pass through the outlet orifices of the fish and debris separators and through the distribution flumes were electronically interrogated for PIT tags. Dates and times of passage were electronically recorded rounded to the nearest second and stored by computer. All recovery data were transferred once each day to the mainframe computer operated by the Pacific States Marine Fisheries Commission in Portland, Oregon.

Results

Collection and Tagging

During 25 working days in August and September, we collected 8,628 wild spring/summer chinook salmon parr in Idaho and Oregon (Table 10 and Appendix Table 17). Of these, 8,250 were PIT tagged and released back into the streams. The numbers tagged and released per stream ranged from 164 in Cape Horn Creek to 1,023 in Valley Creek.

The fork length of PIT-tagged wild fish from Idaho streams ranged from 49 to 104 mm with an overall average of 68 mm (Table 10). The weight ranged from 1.0 to 14.2 g with an overall average of 4.2 g. In the three Oregon streams, the fish were larger, with an average fork length of 77 mm (range 56-104 mm). The average weight of 4.2 g (range 1.6-11.1 g) may not accurately reflect the true average weight of tagged fish in Oregon since only 6.9% of tagged fish were weighed.

As during previous years, mortality and tag loss were low in 1990 (Table 11 and Appendix Table 18). Due to low densities of chinook salmon parr in Idaho streams, collections were made by electro-fishing in all streams in that State. In Oregon streams, the fish were collected either by seines or a box trap. Collection mortality was 1.5 and 0.3% for Idaho and Oregon streams, respectively. The tagging mortality was 0.2% for Idaho and 0.6% for Oregon streams. Of the 1,706 fish held for 24-hour delayed mortality and tag loss in Idaho and Oregon, we recorded 0.4% mortality and 0.0% tag loss. The overall observed mortality was 1.6% for the two states combined.

Table 10.--Summary of the numbers collected, numbers PIT tagged and released, and average lengths and weights of wild spring/summer chinook salmon in summer 1990.

Tagging location	Number collected	Number PIT tagged and released	Average fork length of tagged fish (mm)	Average weight of tagged fish (g)
			Idaho wild	
Bear Valley Creek	358	352	69	4.7
Elk Creek	257	247	76	6.1
Valley Creek	1,089	1,023	68	4.3
Cape Horn Creek	175	164	69	4.6
Marsh Creek	889	861	71	4.9
E. Fork Salmon River	573	532	78	6.3
S. Fork Salmon River	1,024	986	65	3.4
Big Creek	749	724	67	4.2
Secesh River	1,131	1,016	61	2.9
Totals or averages	6,245	5,905	68	4.2
			Oregon wild	
Catherine Creek	1,018	1,012	80	6.3
Lostine River	1,019	1,006	77	4.8
Imnaha River	346	327	69	3.9
Totals or averages	2,383	2,345	77	4.2

Table 11.--Mortality and tag loss for wild spring/summer chinook salmon collected and PIT tagged in Idaho and Oregon in summer 1990.

	Mortality (%)				Tag loss after 24 hours (%)
	Collection	Tagging	24-hour	Overall	
			Idaho		
Bear Valley Creek	1.1	0.0	0.0	1.1	0.0
Elk Creek	1.2	0.0	---	1.2	---
Valley Creek	1.1	0.7	0.0	1.7	0.0
Cape Horn Creek	3.4	0.0	0.0	3.4	0.0
Marsh Creek	1.2	0.0	0.0	1.2	0.0
East Fork Salmon River	6.3	0.0	0.6	6.5	0.0
South Fork Salmon River	1.0	0.4	0.0	1.4	0.0
Big Creek	1.0	0.3	0.0	1.2	0.0
Secesh River	0.4	0.1	1.0	0.6	0.0
Averages	1.5	0.2	0.2	1.8	0.0
			Oregon		
Catherine Creek	0.5	0.0	0.6	0.6	0.0
Lostine River	0.1	0.8	1.1	1.2	0.0
Imnaha River	---	2.1	---	2.0	---
Averages	0.3	0.6	0.9	1.0	0.0

Recovery of Test Fish at Dams

As during the previous 2 years, the detection totals and percentages in 1991 were based on first-time detections of PIT tags at the three collector dams.

A total of 3,627 PIT tags were detected at the three collector dams during spring 1991 (Appendix Tables 19 through 35). Of these, 995 originated from wild releases and the remainder from the three hatchery releases. For wild fish, 64.3, 28.6, and 7.1% were detected at Lower Granite, Little Goose, and McNary Dams, respectively.

The detection rates of wild fish at the dams are illustrated by stream of origin in Figure 2. We detected 12.1% of all wild fish released for this study at the three collector dams. This was a 31.5% increase in recovery from 1990 and a 59% increase from 1989. Detection rates ranged from a low of 6.5% for fish from Valley Creek to a high of 20.7% for fish from Cape Horn Creek. Detection rates at Lower Granite Dam averaged 7.8%, ranging from 3.4% for fish released in the East Fork of Salmon River to 15.2% for fish released in Cape Horn Creek. These rates were 73 and 32% higher than rates for 1989 and 1990 detections, respectively. A total of eight wild fish that were PIT tagged in summer 1989 were detected at the dams in spring 1991. Three of the fish were from Big Creek and five were from the Secesh River.

During the PIT-tag detection/diversion system tests conducted at Lower Granite Dam in spring and summer 1991 (see following section), 84 PIT-tagged wild fish from various streams were

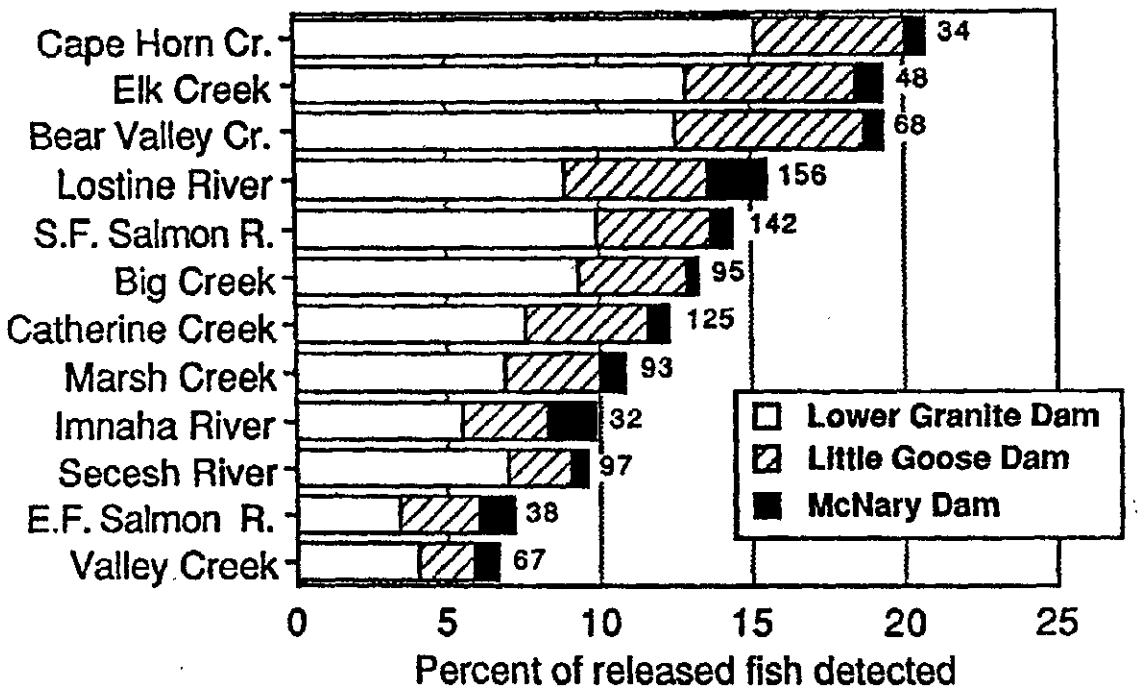


Figure 2.--Percent of PIT-tagged wild spring/summer chinook salmon detected at Lower Granite, Little Goose, and McNary Dams in spring 1991. The Secesh and Imnaha Rivers are considered summer chinook salmon streams.

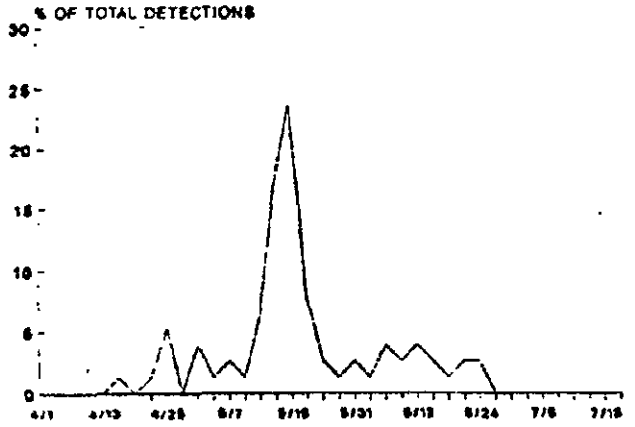
diverted, scanned, weighed, and measured. From the time of tagging, in late summer 1990, to recovery, the average gain in length was 38.5 mm (range 22 to 84 mm), and the average gain in weight was 10.2 g (range 4.1 to 36.3 g). Average time between measurements was 267.9 days (range 218 to 338 days).

Outmigration Timing at Lower Granite Dam

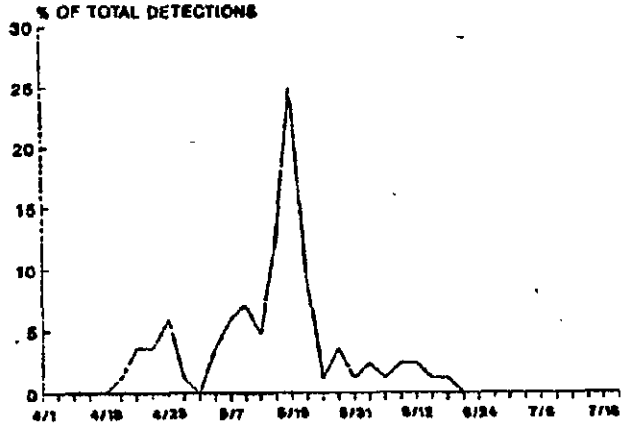
Timing of outmigrations for individual and combined streams along with hatchery populations were calculated from 1 April to 20 July 1991 by the methods used in 1989 and 1990 (Matthews et al. 1990, 1992).

Spring chinook salmon--Figure 3 presents the timing of outmigrations passing Lower Granite Dam of spring chinook salmon smolts for individual streams and hatcheries in 1991. As during the previous 2 years, wild fish outmigration timing varied among individual streams. In the upper Middle Fork of the Salmon River drainage, fish from the Marsh/Cape Horn Creek and the Bear Valley/Elk Creek areas peaked around 20 May with the 50th percentiles of marked fish passing the dam about the same day. The 90th percentile passed on 3 June for the Marsh/Cape Horn Creek area and on 14 June for the Bear Valley/Elk Creek area. This outmigration timing was later than in 1990, when the 50th percentile passed on 29 April for Marsh Creek and on 2 May for Bear Valley Creek, and the 90th percentile passed on 31 May for both streams (Matthews et al 1992). Fish from Big Creek, a tributary of the lower Middle Fork of the Salmon River, peaked at the dam on 14 June, much later than other stocks. The 50th and 90th percentiles passed on 10 and 26 June, respectively. This stream also displayed the

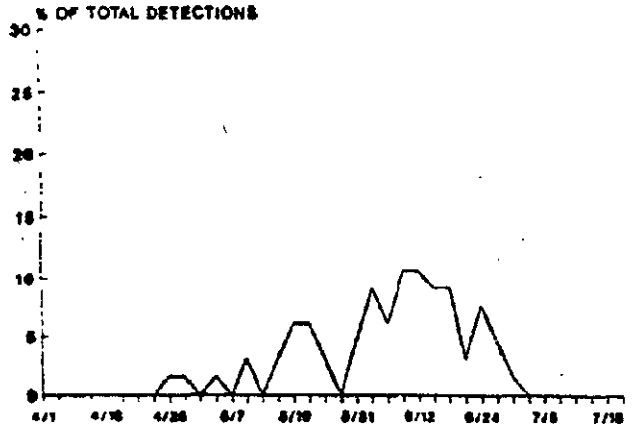
BEAR VALLEY/ELK CREEK



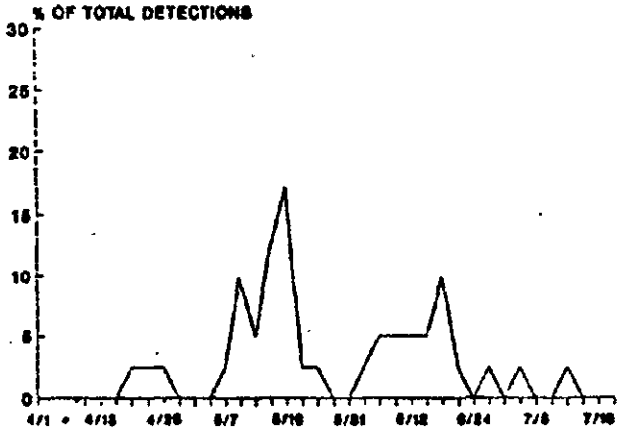
MARSH/CAPE HORN CREEK



BIG CREEK



VALLEY CREEK



EAST FORK SALMON RIVER

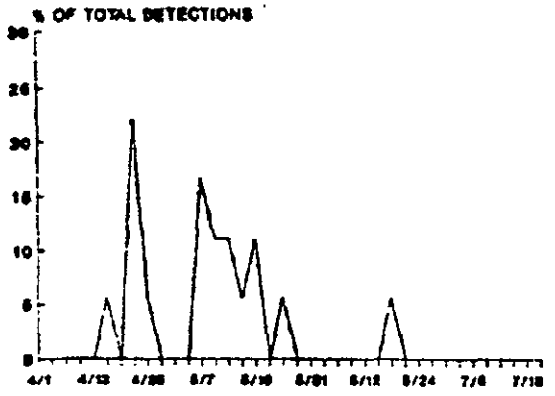
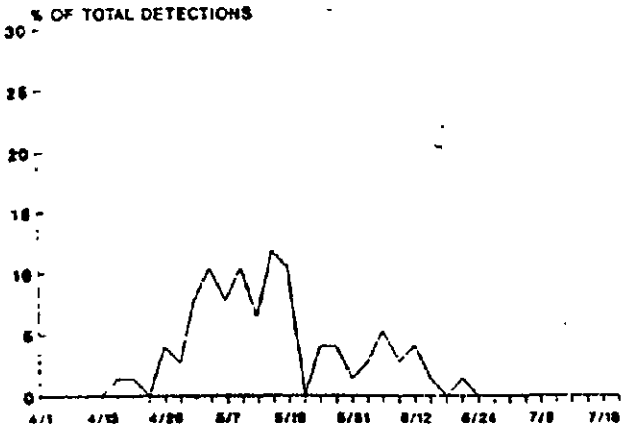
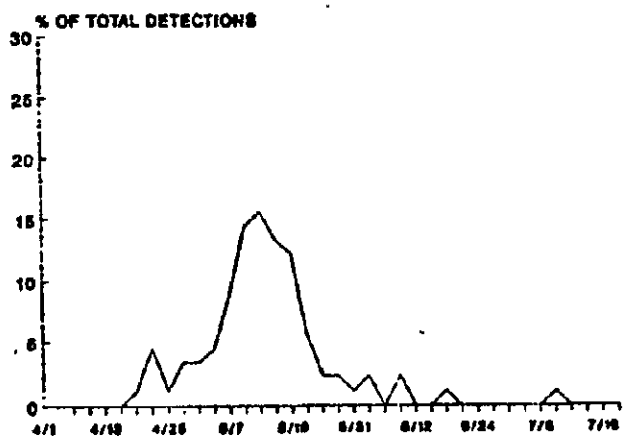


Figure 3.--The outmigration timing of spring chinook salmon smolts at Lower Granite Dam in 1991 by individual streams and hatcheries.

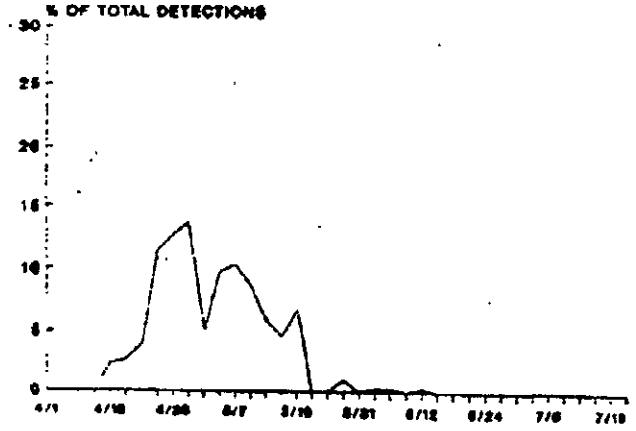
CATHERINE CREEK



LOSTINE RIVER



SAWTOOTH HATCHERY



DWORSHAK HATCHERY

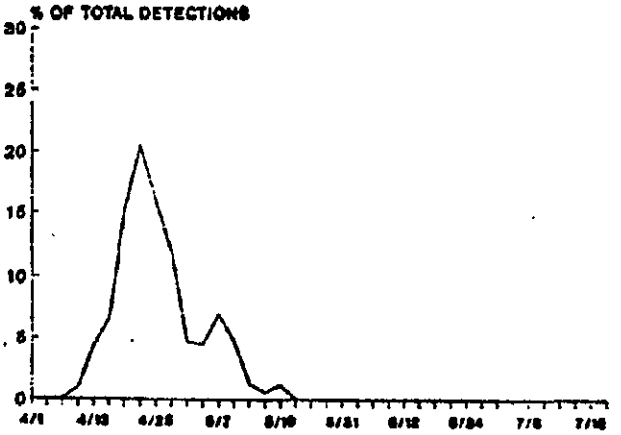


Figure 3.--Continued.

latest timing during 1990. Moreover, compared to 1990, the 1991 outmigration timing for this stream was 11 days later for the 50th percentile and 4 days later for the 90th percentile passage. Outmigration timing for wild spring chinook salmon from Valley Creek, a tributary of the upper Salmon River, was similar to timing observed for streams in the upper Middle Fork of the Salmon River. Migration peaked at the dam on 20 May, with the 50th and 90th percentiles passing on 20 May and 20 June, respectively. This was the latest timing for this stream during the 3-year study. Fish from the East Fork of the Salmon River, another tributary of the upper Salmon River, showed a much different outmigration timing at the dam than fish from Valley Creek and the streams in the Middle Fork of the Salmon River. Migration for these fish peaked at the dam twice, once on 23 April and again on 11 May, with the 50th and 90th percentiles passing on 9 and 26 May, respectively. The outmigration timing for this stream in 1991 was similar to 1989 when the 50th and 90th percentiles passed the dam on 3 and 18 May, respectively (Matthews et al. 1990). The timing of the outmigrations of wild spring chinook salmon smolts from the Lostine River and Catherine Creek, tributaries of the Grande Ronde River in Oregon, was similar. Migration peaked at the dam about 12 May (Catherine Creek displayed a second peak on 20 May), with the 50th percentile passing the dam on 14 May. The 90th percentile passage dates were 26 May for the Lostine River and 8 June for Catherine Creek.

The outmigration period of hatchery spring chinook salmon smolts at Lower Granite Dam was much more compressed than for their

wild counterparts. Hatchery fish were in abundance early in the outmigration, with very few detections at the dam after 15 May. Both Sawtooth and Dworshak Hatchery migrations peaked at the dam on 24 April. Sawtooth Hatchery fish displayed a more protracted outmigration period at the dam than Dworshak Hatchery fish. The 50th percentile passage occurred on 25 April for Dworshak and 3 May for Sawtooth Hatchery fish. The 90th percentile passages occurred on 9 and 17 May for the outmigrations for each hatchery, respectively. While Dworshak Hatchery fish displayed almost identical migration timing at the dam during both 1990 and 1991, Sawtooth Hatchery fish showed a later migration for 1991 than for either 1989 or 1990 (Matthews et al 1990, 1992).

To illustrate the overall difference in timing between wild and hatchery fish in 1991, we combined all wild and hatchery recoveries into their respective groups (Fig. 4). The combined wild fish outmigration at Lower Granite Dam was characterized by a large peak on 20 May, coincidental with the highest flow and turbidity of the year. The 50th percentile passed the dam on 19 May and the 90th percentile passed the dam on 15 June. The combined hatchery outmigration peaked on 24 April, with the 50th and 90th percentiles passing the dam on 26 April and 10 May, respectively.

In general, the five peak passage periods for wild spring chinook salmon smolts at Lower Granite Dam during the past 3 years (Fig 5), coincided with periods of peak river discharge at the dam. However, the peaks tended to consist primarily of fish from a few streams each year. Whether the increased river discharge moved these groups of fish through the reservoir or were simply

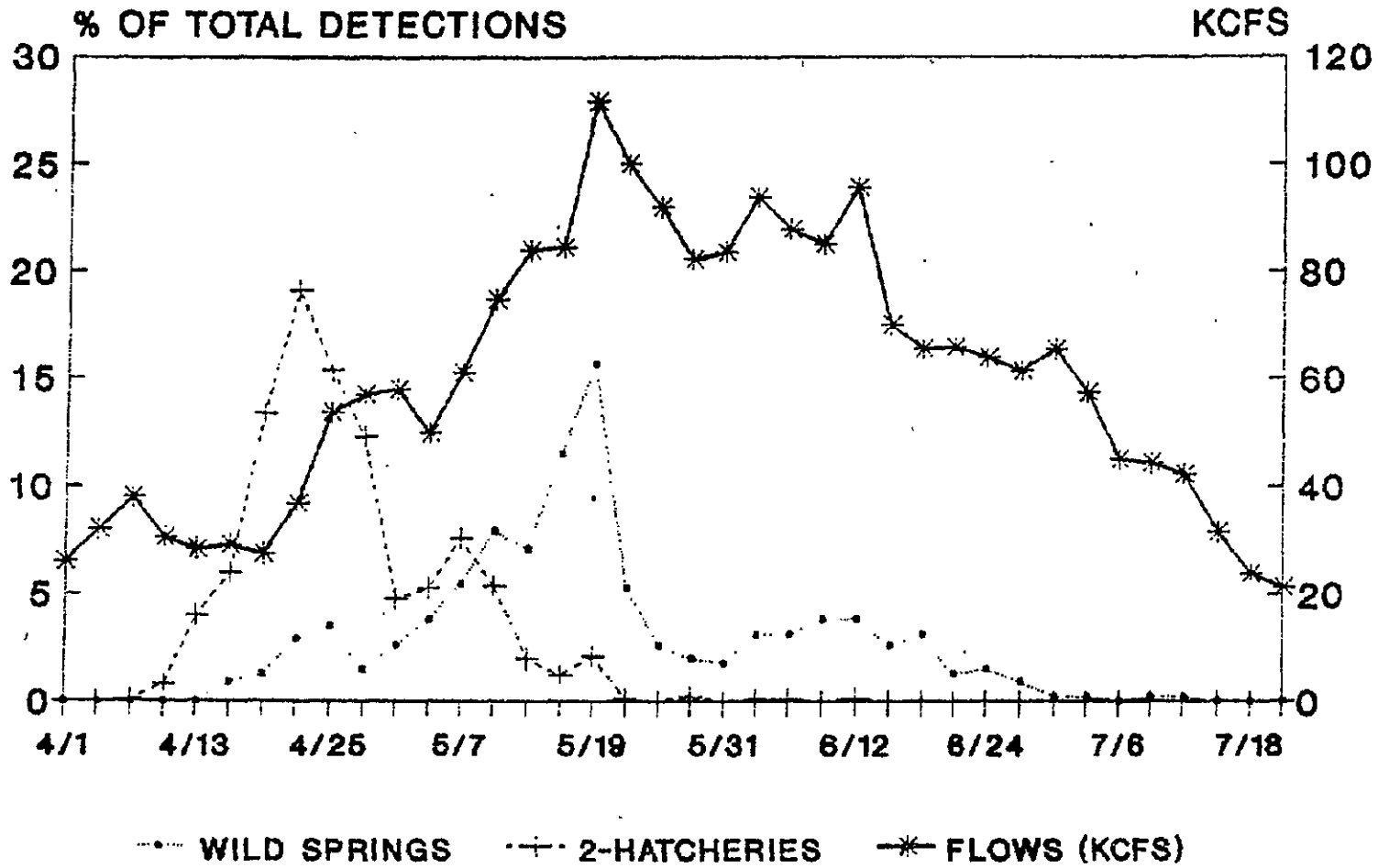


Figure 4.--The outmigration timing of wild and hatchery-reared spring chinook salmon at Lower Granite Dam in 1991. Data represents recoveries from all wild streams combined and Dworshak and Sawtooth Hatcheries combined.

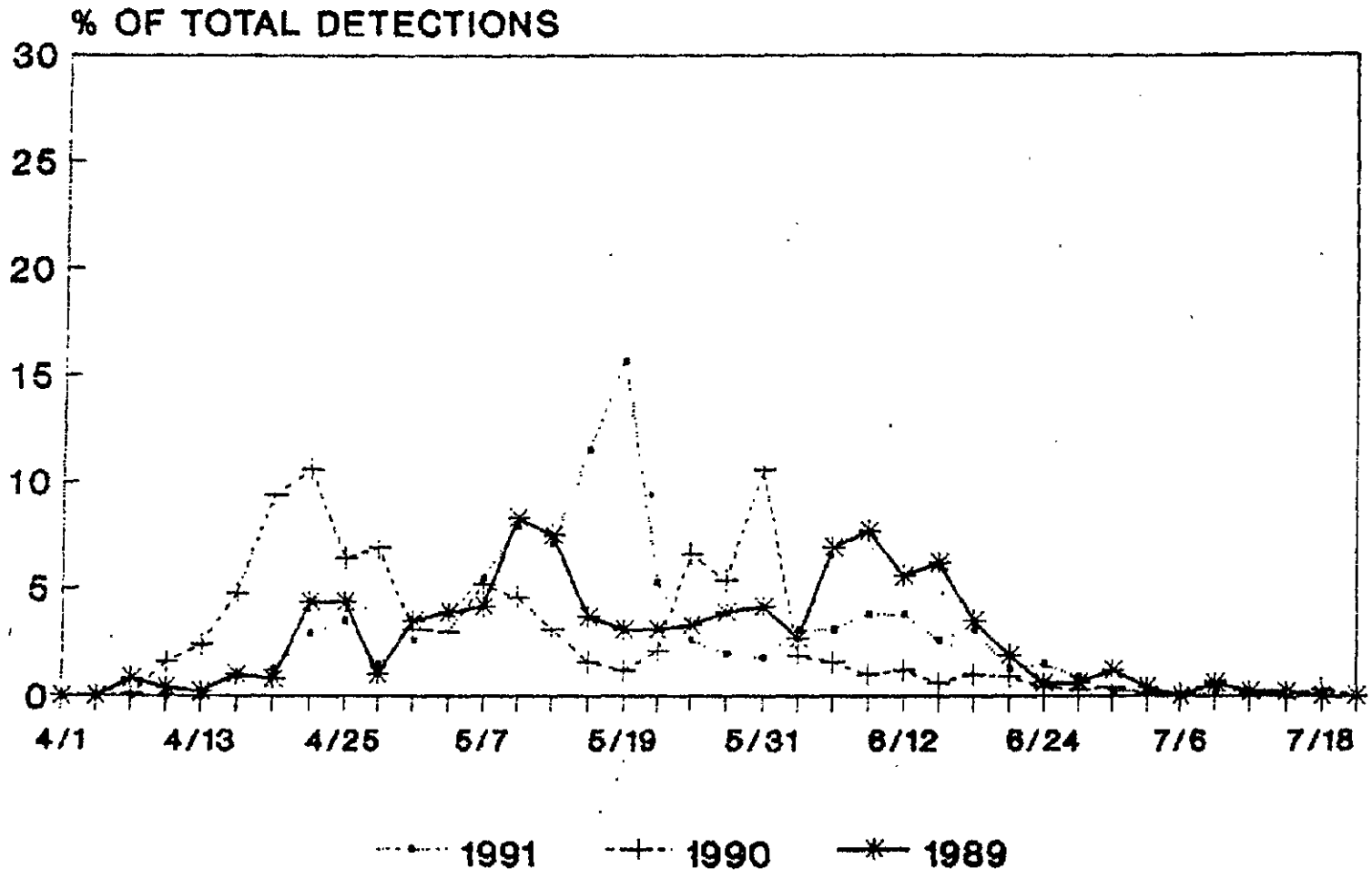


Figure 5.--The outmigration timing of wild spring chinook salmon at Lower Granite Dam in 1989, 1990, and 1991. Data represents recoveries from all wild streams combined each year.

coincidental with their arrival at the dam was unknown. Since the peaks occurred almost simultaneously with increased discharge, it seems likely that the fish were in the immediate vicinity of the dam and were simply moved through it rapidly by the increased flow. Although in 1991 the peak outmigration periods occurred at different times than in 1989 (the 1989 study did not include fish from the Middle Fork of the Salmon River), the 50th and 90th percentile passage dates at the dam were almost identical for both years. In contrast, the 50th and 90th percentile passage dates were about 12 and 10 days earlier in 1990 than in 1989 or 1991.

In contrast to wild fish, the outmigration timing for hatchery spring chinook salmon was remarkably similar for all 3 years of the study (Fig. 6). Migrations of hatchery spring chinook salmon smolts peaked at the dam during the same 3-day period (22-24 April) under highly variable flows, averaging 111, 73, and 37 kcfs during the 3-day periods in 1989, 1990, and 1991, respectively. The 50th and 90th percentile passage dates were also similar, varying by only 4 to 6 days over the 3 years.

Summer chinook salmon--Figure 7 illustrates the outmigration timing of wild and hatchery summer chinook salmon smolts at Lower Granite Dam in 1991. Migration of Secesh River fish peaked at the dam on 24 April, with the 50th and 90th percentiles passing on 27 April and 14 June, respectively. This stream exhibited similar outmigration timing patterns in all 3 years, with 50% of the fish passing the dam by the last week of April and 90% passing by the second week of June. Migration of fish from the South Fork of the Salmon River peaked on 20 April and 22 May; the 50th and 90th

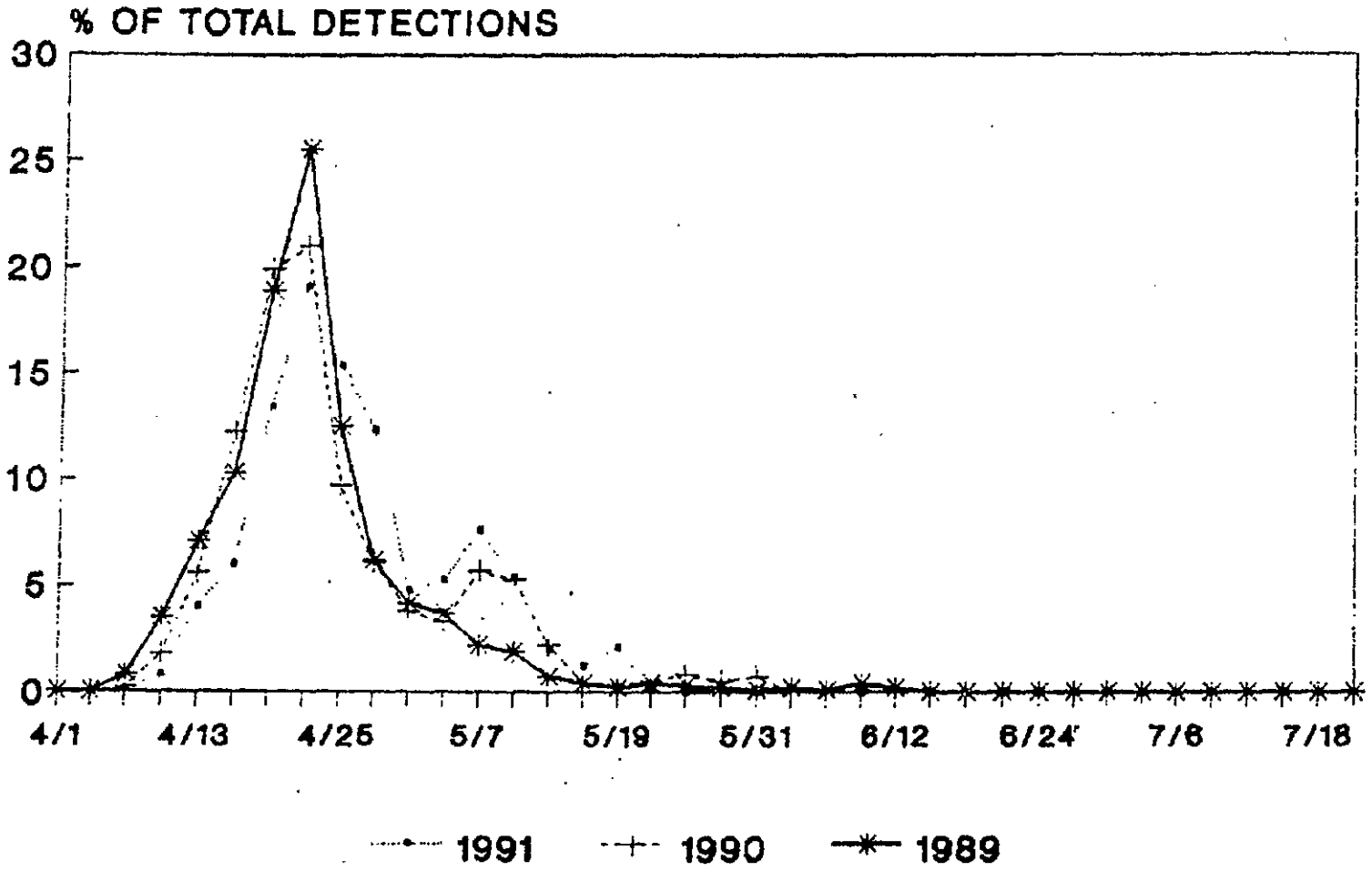


Figure 6.--The outmigration timing of hatchery-reared spring chinook salmon at Lower Granite Dam in 1989, 1990, and 1991. Data represents recoveries from Sawtooth and Lookingglass Hatcheries combined in 1989, and from Sawtooth and Dworshak Hatcheries combined in 1990 and 1991.

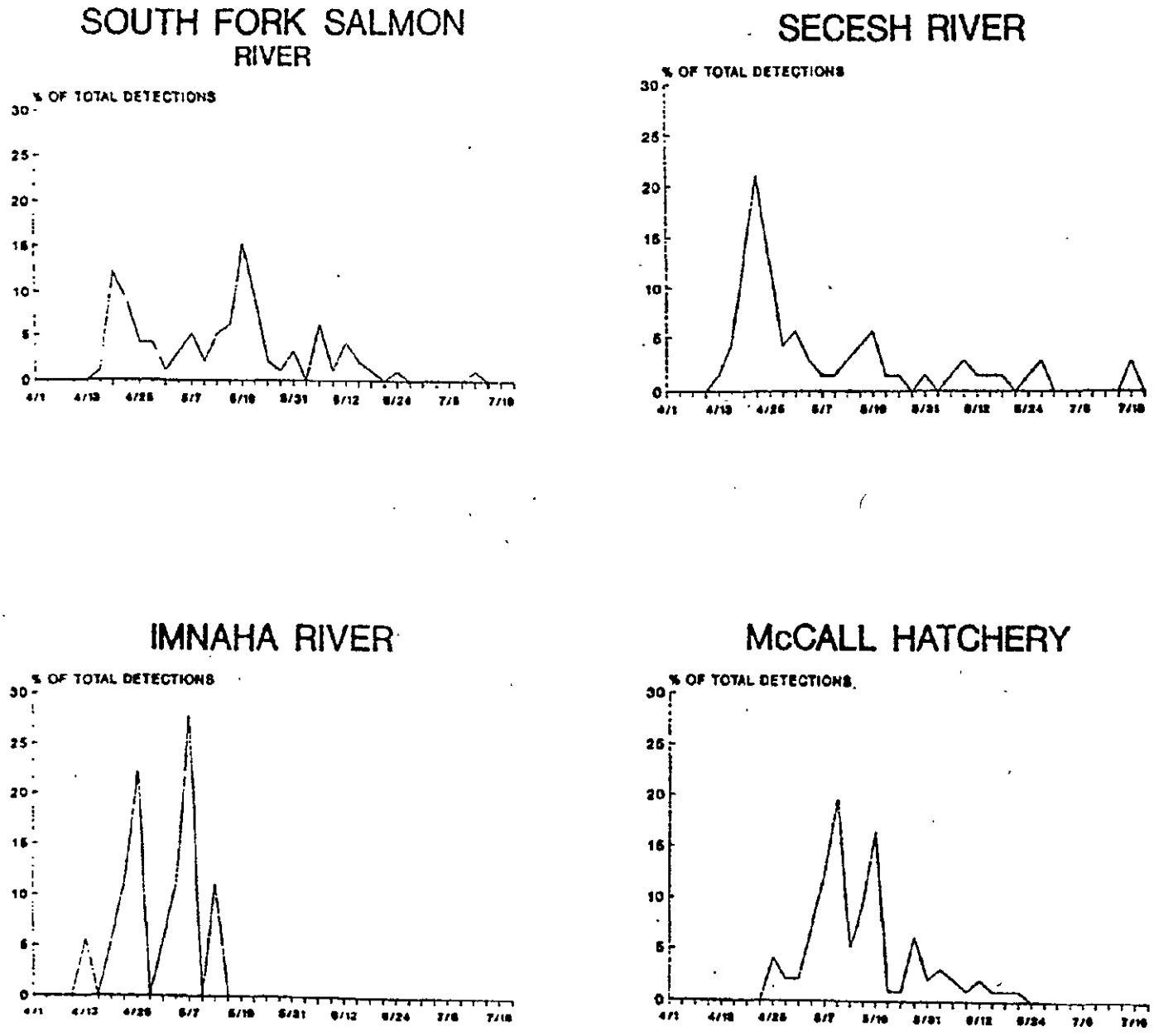


Figure 7.--The outmigration timing of summer chinook salmon at Lower Granite Dam in 1991 by individual streams and McCall Hatchery.

percentiles passed the dam on 16 May and 10 June, respectively. This pattern was a similar to the outmigration timing observed at the dam in 1989 (the only other year of tagging in this stream), with 50% passing by the middle of May and 90% passing by the second week of June in both years (Matthews et al 1990). Migration of fish originating in the Imnaha River peaked at the dam on 25 April and 8 May, with the 50th and 90th percentiles passing the dam on 1 and 13 May, respectively. In this stream, the earliest timing of all wild fish during all 3 years of study was observed, with over 50% of the fish passing the dam in April and over 90% passing by mid-May.

In 1991, the outmigration period for hatchery summer chinook salmon smolts at Lower Granite Dam was later and more compressed than for their wild counterparts, but not as compressed as the outmigration of hatchery spring chinook salmon smolts. Migration peaks of hatchery summer chinook salmon occurred on 12 and 19 May, with the 50th and 90th percentiles passing the dam on 14 May and 4 June, respectively. The 50th and 90th percentile passage dates for these fish in 1991 were very close to those for 1989 (Matthews et al. 1990).

The combined outmigration timing of all wild summer chinook salmon showed peaks occurred on 20 and 24 April and on 20 May, with the 50th percentile passing the dam on 8 May and the 90th percentile on 11 June (Fig. 8).

During the 3-year study, peak outmigration periods at Lower Granite Dam for wild summer chinook salmon (Fig. 9) were generally variable and did not necessarily coincide with peaks in river discharge. In all 3 years, peak outmigration periods occurred in

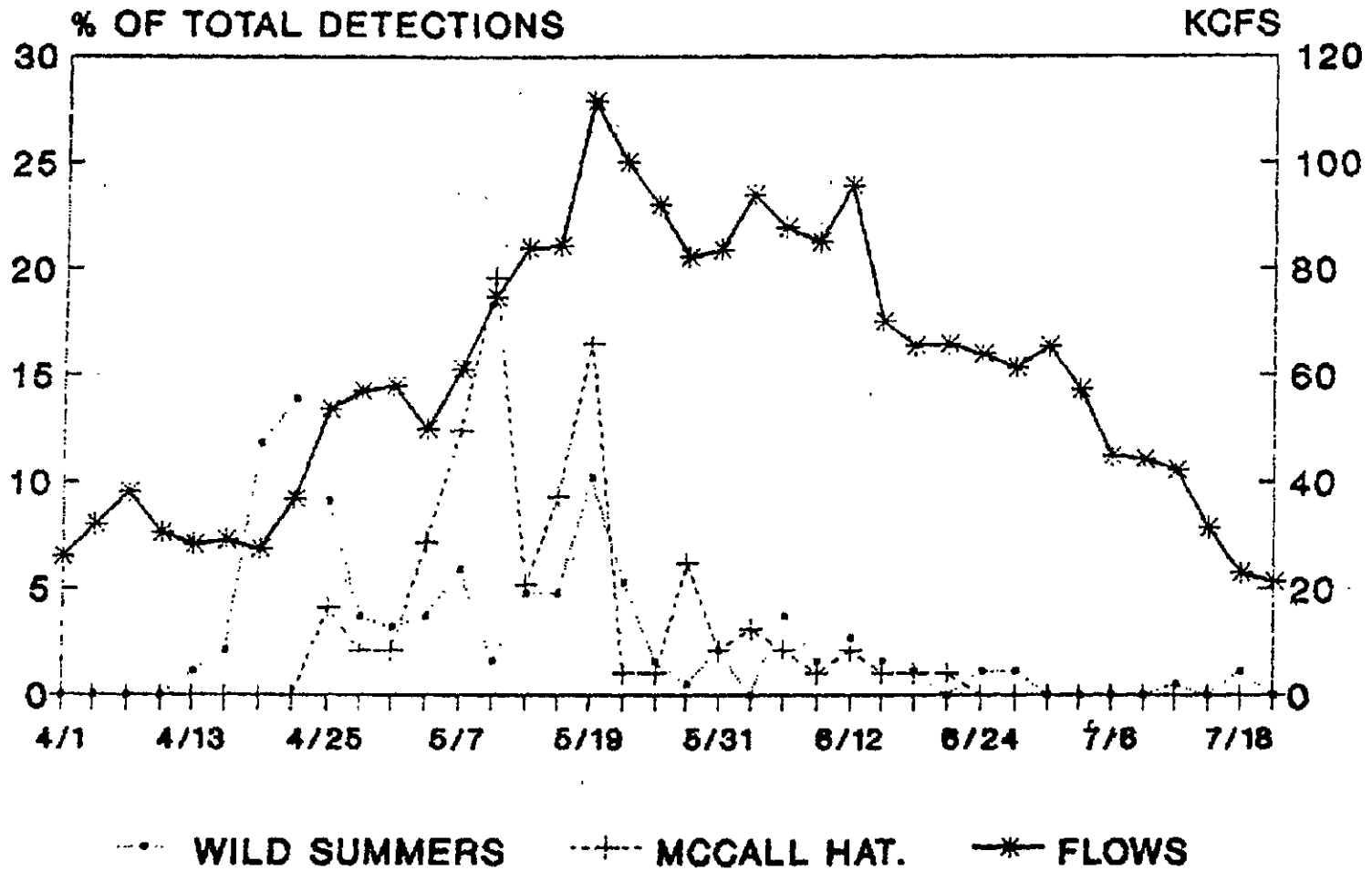


Figure 8.—The outmigration timing of summer chinook salmon at Lower Granite Dam in 1991. Data represents recoveries from both wild streams combined and McCall Hatchery.

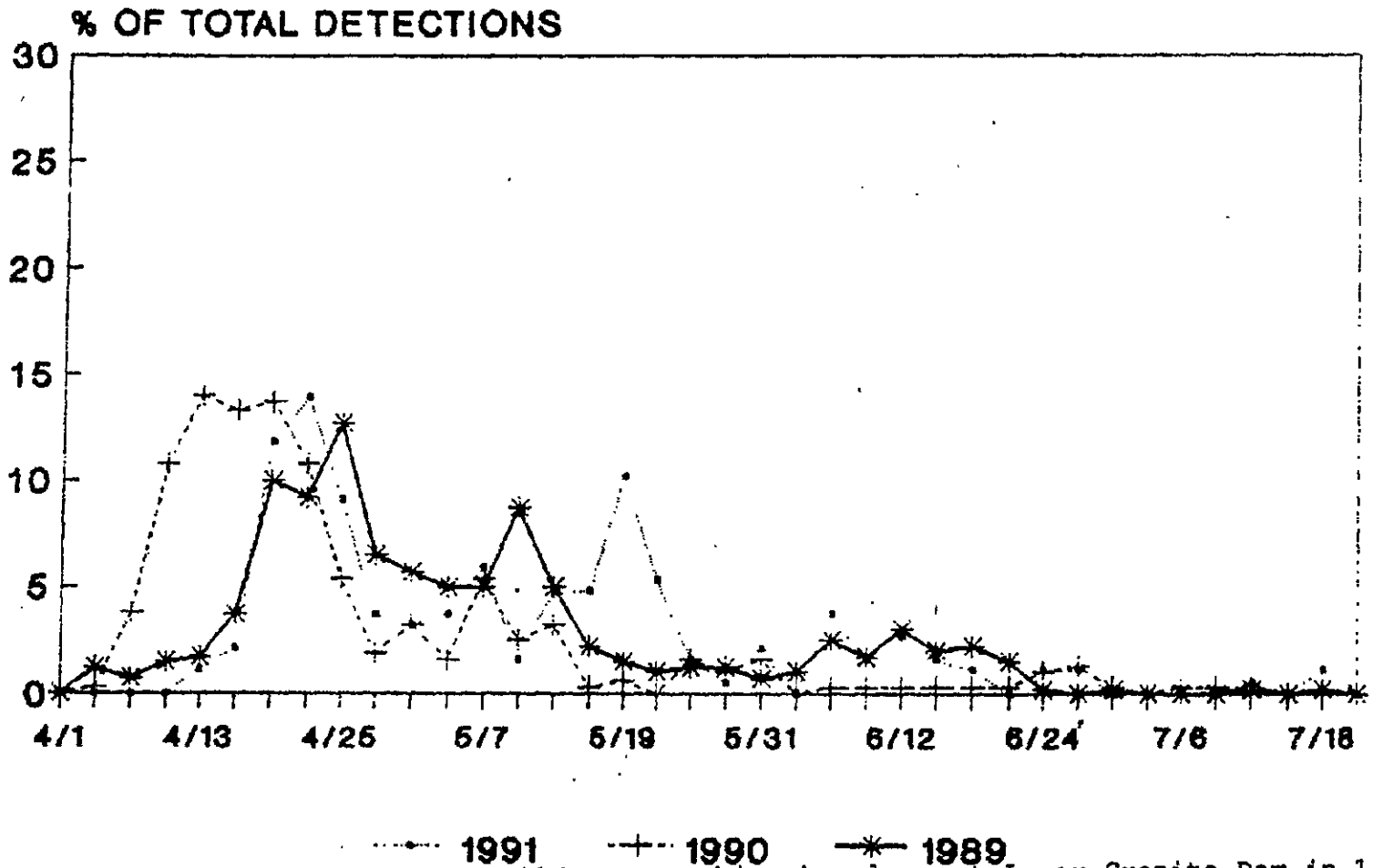


Figure 9.--The outmigration timing of wild summer chinook salmon at Lower Granite Dam in 1989, 1990, and 1991. Data represents recoveries from both wild streams combined for each year.

April under moderate to low river flows of 86.9, 48.9, and 36.9 kcfs for 1989, 1990, and 1991, respectively.

During both years that hatchery summer chinook salmon were included in the study (1989 and 1991), they displayed later timing than their wild counterparts (Fig. 10). Also, in contrast to wild smolts, peak passage periods for hatchery fish were similar in both years.

Discussion

Collection and tagging methods used in the summers of 1988 and 1989 were again highly effective and successful during summer 1990. However, due to the low densities of chinook salmon parr in most streams during 1990, we covered roughly twice the area in the streams to collect half as many fish as were collected in 1989. Because of the low parr densities, we had to use electro-fishing in most streams, and collection mortality was slightly higher than in 1988 or 1989. However, the tagging and 24-hour delayed mortalities were lower than during the previous 2 years. With the present equipment, an additional crew, and adequate parr densities, we believe it would be possible to capture and tag up to 80,000 wild fish during August and September for a full-scale transportation study. However, due to severely reduced escapements of wild adult spring and summer chinook salmon into Idaho and Oregon streams in recent years, a full-scale study will not be feasible in the near future.

Although recovery rates of wild fish at collector dams were higher during spring 1991 than the previous two springs, they were

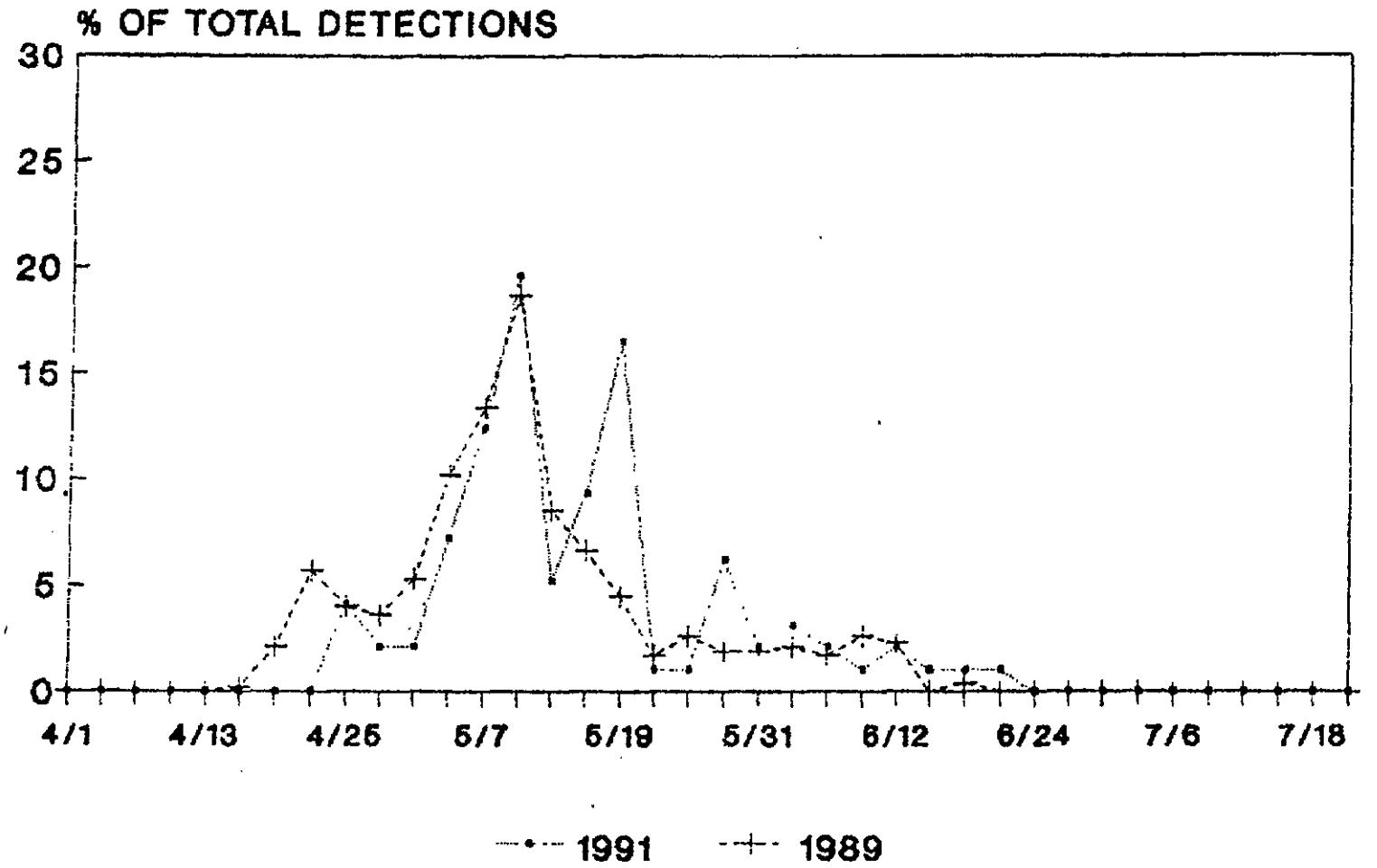


Figure 10.--The outmigration timing of hatchery-reared summer chinook salmon at Lower Granite Dam in 1989 and 1991. Data represents recoveries from McCall Hatchery for each year.

still lower overall than originally anticipated. However, recoveries from some streams approached original expected recovery rates at the dams. We appear to have overestimated overwinter survival for most years. However, all 3 study years coincided with the extended drought period in the Snake River. Matthews et al. (1990) reported that environmental conditions were severe during the winter of 1988-89, which may have reduced overwinter survival more during the first year of the study. During the second study year, the winter was not as severe; even so, we only realized a 31% increase in recovery of wild fish at Lower Granite Dam. In streams tagged in both 1988 and 1989, two had lower and two had higher recovery rates at the dam during the second year. This may suggest that fish originating from streams in the Middle Fork of the Salmon River, which were added during the second study year, may have higher overwinter survival regardless of environmental conditions. The winter for the third study year of 1990-91 was relatively mild. Substantial increases in recovery rates of wild fish were observed at Lower Granite Dam from all streams in the Middle Fork of the Salmon River except Marsh Creek. In the remaining four streams, two had higher and two had lower recovery rates at the dam than during the previous year.

The recovery proportions measured for wild fish among the three collector dams were similar for all 3 years of study. This was in spite of the fact that environmental conditions (particularly temperature and flow) varied considerably over the 3 years.

The outmigration timing of wild spring and summer chinook salmon smolts from individual streams at Lower Granite Dam varied in

1991, and also differed from individual streams in the 1989 and 1990 outmigrations. The outmigration timing of fish from individual wild spring chinook salmon streams also varied more than that of fish from individual wild summer chinook salmon streams during the 3 years of study. In all 3 years, wild spring chinook salmon smolt outmigrations were protracted and encompassed nearly the entire spring and early summer migration period. In the first 2 years, the combined outmigrations of these fish displayed two peaks; however, the first peak was earlier and stronger in 1990 than in 1989, resulting in an overall earlier passage observed at the dam. The third year differed from the previous two, with one strong peak passage period around 20 May. We suspect that different environmental conditions, extant during the late winters and early springs of the 3 years, resulted in the variability in outmigration timing among the years. In 1989, a late, cold winter and early spring produced lower water temperatures. Low temperatures probably delayed the outmigrations of wild fish, even though river flows were near average for the period in April. In 1990, the late winter and early spring period was very mild, producing warmer than normal spring water temperatures. This may have contributed to the earlier outmigration of wild fish for that year even though river flows were below normal for the period. In 1991, the spring and early summer were the coldest in many years, and the resultant low water temperatures may have contributed to the late outmigrations of these fish. River flows were also lower than normal for this period. Raymond (1979) cites water temperature as one of the most important

factors involved in triggering the downstream movements of hatchery and wild chinook salmon smolts in spring.

Hatchery spring chinook salmon smolts were less influenced by differing environmental factors. In all 3 years, these fish displayed virtually the same outmigration pattern, with migration peaking at the dam within the same 3-day period.

In all 3 years of study, wild summer chinook salmon smolt migrations peaked at Lower Granite Dam in April, before wild spring chinook and hatchery summer chinook salmon smolts. Moreover, these fish passed the dam earlier in 1990 than in 1989, even under lower river discharge in 1990.

Outmigration timing of hatchery spring and summer chinook salmon smolts and wild summer chinook salmon smolts may be more closely related to the time of year than to river discharge at the dam. In contrast, the peak outmigration periods for wild spring chinook salmon coincided with peak flow periods at the dam. In addition to flow, other factors such as physiological development, variability in stock behavior, and other environmental factors may affect the passage timing of wild chinook salmon smolts.

Data from this pilot study have provided valuable insight concerning the migrational behavior of different stocks of wild chinook salmon smolts in the Snake River Basin. These studies should continue in order to characterize run-timing of various stocks of wild fish. Data should be collected over several years, encompassing different environmental conditions. Information gained will be critical for making sound management decisions to provide for increased survival of all stocks in the future.

ASSESSMENT OF A PIT-TAG DETECTION/DIVERSION SYSTEM AT LOWER GRANITE DAM

Introduction

In spring 1989, a PIT-tag detection/diversion system was installed and tested in the juvenile fish collection facility at Lower Granite Dam (Matthews et al. 1990). The principal feature of the system is a sliding gate (slide gate) in the bottom of each of two flumes exiting the fish and debris separator. The slide gates divert or remove PIT-tagged fish from the general population of fish passing through the flumes to the collection raceways or barges. During the first year of testing (1989), several major design problems were identified and corrected, and more testing was conducted during the 1990 smolt outmigration (Matthews et al. 1991).

The 1990 tests indicated that the corrections and adjustments produced the desired results. For example, by increasing the slope of the flumes and stabilizing the velocity of the water exiting the separator, the overall average number of untagged fish diverted per diversion cycle decreased from 1.7 in 1989 to 1.2 in 1990. Also, mortality rates for spring/summer chinook decreased from 0.4% in 1989 to 0.1% in 1990, and for steelhead from 8.8% in 1989 to 0.6% in 1990. However, when hourly facility counts exceeded 20,000 fish or when steelhead numbers were high, we observed higher than expected rates of untagged fish diverted per cycle, injuries, and mortalities (Matthews et al. 1991).

After the 1990 testing season, two major changes were recommended and incorporated into the system. First, both of the flumes exiting the fish and debris separator were painted black on

all interior surfaces. Lids, with their undersides painted black, were fabricated to cover the tops of the flumes. These modifications were intended to eliminate any light stimulus that might influence fish behavior. It was postulated that some of the fish, particularly steelhead, were reacting to the brightly lit flume by swimming vigorously against the current. This would cause the fish either to delay their movement between the PIT-tag detector and the slide gate or to delay their departure from near the slide gate. In the first case, a PIT-tagged fish might not be diverted as desired, while in the second case, the chances of diverting untagged fish might increase whenever a PIT-tagged fish activated the slide gate. It was believed that darkening the flumes would alleviate these problems by decreasing the volitional swimming of steelhead smolts as they left the separator.

The second adjustment was the addition of a buffer near the end of the slide-gate closure. In the past, the ram controlling the slide gate closed the gate at a uniform speed until the gate was completely closed. Because of this, fish caught in the gate as it closed had an increased chance of injury or death. The buffer allowed the slide gate to close at full speed until it was 2.5-5.0 cm from complete closure. At this point, the slide gate slowed down significantly in order to allow any fish in the area of the leading edge of the slide gate time to escape before complete closure.

The primary objectives of the 1991 testing were to determine if these changes produced the desired effects of decreasing injuries, mortalities, and numbers of untagged fish diverted per cycle. These

effects were particularly critical during periods when facility fish counts were greater than 20,000 fish per hour.

Methods

As in past years, the efficiency of the system was defined as the ratio of untagged fish diverted per PIT-tag diversion cycle. Since this ratio is a function of cycle time and number of fish moving past the system per hour, an expected value for this ratio can be estimated. During the 1990 testing season, twice as many PIT-tagged fish passed through the south than the north flume (Matthews et al. 1992). This pattern was observed again during the 1991 testing season. Assuming that PIT-tagged fish were randomly interspersed among other fish, PIT-tag detections indicated that 33% of the fish passed through the north flume and 67% passed through the south flume. Because of this inequity, an expected value for the number of untagged fish per cycle was designed to reflect the non-equal distribution of fish between the two flumes. The formula used to estimate the expected value was:

$$\text{Expected Value} = \sum_{i=1}^{n}\left[\frac{H_i\left(P^2 t_{ni} + (1-P)^2 t_{si}\right)}{3600n}\right]$$

where: n = the number of tests in each grouping

i = 1,...,n

H_i = the expanded hourly facility count for test i

P = 1/3 (the amount of fish passing through the north flume)

t_{ni} = the cycle time for the north slide gate for test i

t_{si} = the cycle time for the south slide gate for test i

This formula assumed a linear relationship between the facility count and the expected value. As the facility count increased, the expected value increased proportionally (Fig. 11).

The efficiency of the PIT-tag detection/diversion system was determined by conducting hourly tests during the 1991 smolt outmigration. Half of the tests were run at night, while the other half were split between early morning and mid-afternoon. The hourly count of fish passing through the facility and the number of PIT-tag diversion cycles were not known until after each hourly test was complete. The hourly fish counts were determined using the facility sample counts for each hour of testing.

At the end of each hourly test, fish were removed from the collection tank with a sanctuary dipnet and anesthetized. They were then scanned for PIT tags, identified by species, counted, and observed for injury and descaling. In addition, all PIT-tagged fish were weighed and measured to fork length. All fish were returned to the collection system for transportation after recovery from the anesthetic.

Results and Discussion

During the testing season, 150 successful tests were conducted (Table 12 and Appendix Tables 36 through 39). Several tests were aborted because of mechanical and/or electronic problems. Testing was planned to start in early April; however, due to low fish numbers, daily testing did not begin until late April. The highest hourly facility fish count tested was 39,300.

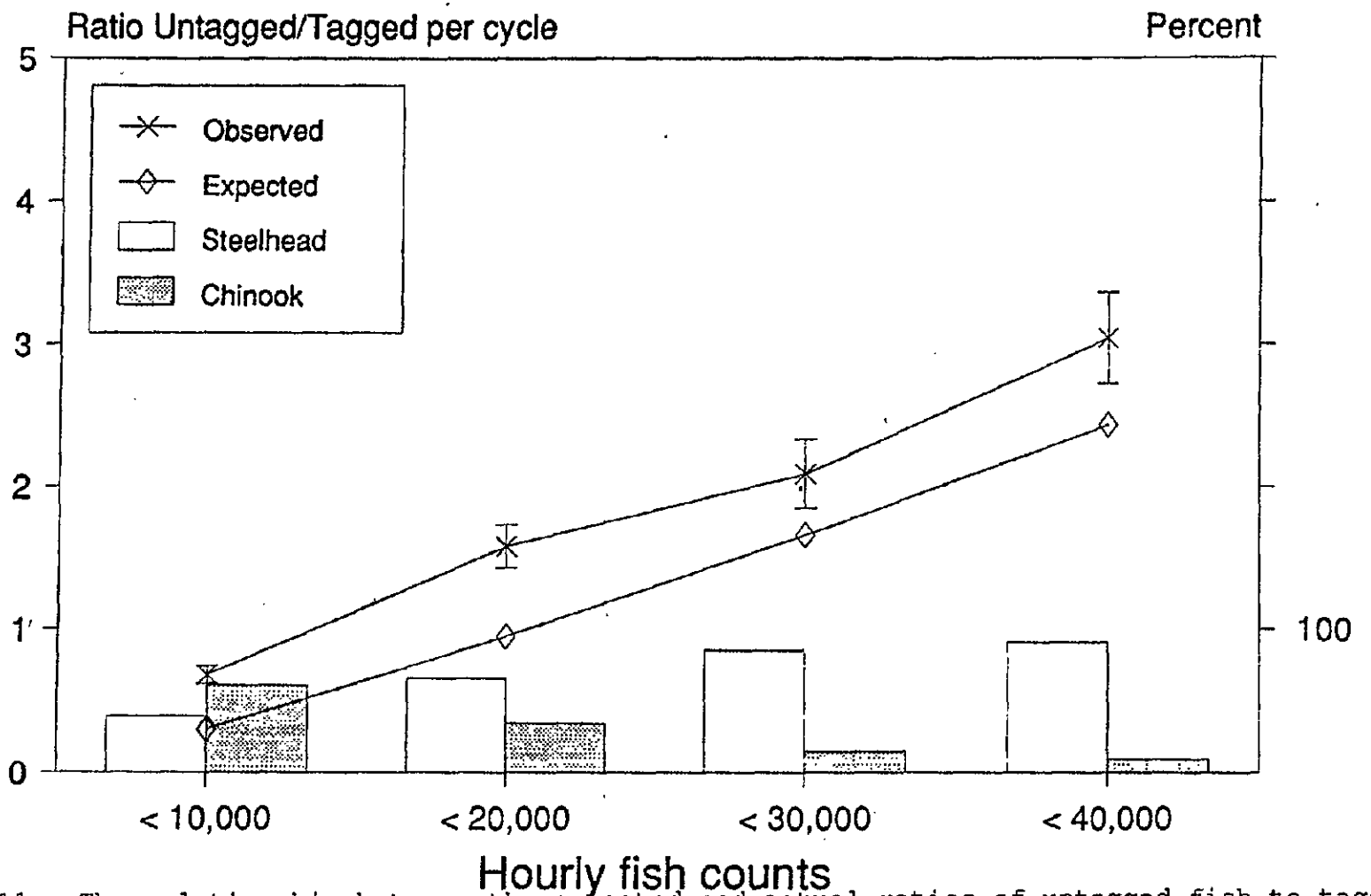


Figure 11.--The relationship between the expected and actual ratios of untagged fish to tagged fish diverted per diversion cycle when the percentage of steelhead was less than or greater than 50% of the sample.

Table 12.--Summary of results of PIT-tag detection/diversion system testing at Lower Granite Dam in 1991.

Hourly Fish Counts	Number of Tests	Untagged Fish per Cycle	Standard Error	Expected Value
< 5,000	60	0.43	0.07	0.18
5,001-10,000	43	0.97	0.09	0.49
10,001-15,000	24	1.39	0.16	0.82
15,001-20,000	12	1.97	0.29	1.22
20,001-25,000	4	1.92	0.31	1.54
25,001-30,000	2	2.43	0.34	1.89
30,001-35,000	3	3.19	0.54	2.34
35,001-40,000	2	2.83	0.25	2.56
Totals and Averages	150	1.03	0.07	0.58

The efficiency of the system ranged from 0.43 untagged fish diverted per cycle, when facility counts were below 5,000 fish per hour, to 3.19 untagged fish diverted per cycle when facility counts were between 30,000 and 35,000 fish per hour (Table 12).

In examining the effect of steelhead abundance on the efficiency of the system, the darkening of the flumes appeared to produce the desired result. The efficiency of the system was 0.62 untagged fish diverted per cycle when the percentage of steelhead was under 50%, and 1.32 untagged fish diverted per cycle when the percentage of steelhead was over 50% (Fig. 11). While this may seem like a large increase, it related to the hourly facility count. The average hourly facility count was 4,264 when steelhead comprised less than 50% of the population, but was 11,406 when steelhead comprised greater than 50% of the population. Since we defined the expected value as a linear function of the hourly facility count, the efficiency would have been expected to decrease more than it actually did based solely on the increase in the hourly facility count. Therefore, the numbers of steelhead in the population appeared to have no effect on the efficiency of the system.

The descaling/injury rates were somewhat greater than measured during the two previous seasons (Matthews et al. 1990, 1992), averaging 5.5% for spring/summer chinook and 3.2% for steelhead. These values were also somewhat higher than those measured for the collection facility in general (Ceballos et al. 1992). Presumably, the descaling/injury rates in our tests during all years were inflated to an unknown degree by collection and handling procedures during data retrieval.

Overall results of the third year of testing the PIT-tag detection/diversion system indicated that the system functioned well, with higher efficiency, in terms of untagged fish diverted per cycle, than we had originally expected. Furthermore, the efficiency of the system was not impacted by the percentage of steelhead in the population as in past years, and the mortality rate for this species was decreased significantly from the previous year. We believe that the system at Lower Granite Dam is ready for use in research or monitoring programs. It is sufficiently simple to set up and operate for individual researchers to be able to easily fine tune it to accomplish their particular goals.

APPENDIX 1

Data Tables

Appendix Table 1.0.--Summary of all recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam in 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706A 8706B 8706C 8706D 8706E 8706F 8706G 8706H 8706I 8706J 8706K

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA2 1 RA2 2 RA2 3 RA2 4 RA9 3 RA9 4 RASU1 RASU3 RASU2 RA9 1 RA9 2
Wire Codes Used: 231943 231944 231945 231946 232018 232019 232022 232029 232023 231947 - 231948

NUMBER RELEASED: 50207

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	13	1	0	0	14	0.028
LOWER GRANITE TRAP	0	12	66	13	0	0	91	0.181
OCEAN FISHERIES								
ALASKA	0	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	2	0	0	0	0	2	0.004
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	1	0	0	0	0	1	0.002
RIVER COMMERCIAL								
COL. R. TEST FSHRY (ORE)	0	0	1	0	0	0	1	0.002
INDIAN FISHERY								
INDIAN CEREMONIAL	0	0	2	2	0	0	4	0.008
HATCHERIES								
DWORSHAK H.	0	0	21	1	0	0	22	0.044
RAPID RIVER H.	0	0	10	0	0	0	10	0.020
KOOSKIA H.	0	0	1	0	0	0	1	0.002
LOOKINGGLASS H.	0	0	2	0	0	0	2	0.004
GENERAL	0	0	1	0	0	0	1	0.002
STREAM SURVEY	0	0	0	1	0	0	1	0.002
UNKNOWN	0	0	0	1	0	0	1	0.002
TOTALS	0	15	117	19	0	0	151	0.301
PERCENT OF RECOVERY %	0.0	9.9	77.5	12.6	0.0	0.0		

Appendix Table 1.1.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 10 to 16 April 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706A

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA2 1
Wire Codes Used: 231943

NUMBER RELEASED: 4226

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	3	0	0	0	3	0.071
LOWER GRANITE TRAP	0	0	4	1	0	0	5	0.118
OCEAN FISHERIES								
ALASKA	0	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	1	0	0	0	0	1	0.024
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COL. R. TEST FSHRY (ORE)	0	0	1	0	0	0	1	0.024
INDIAN FISHERY								
INDIAN CEREMONIAL	0	0	0	2	0	0	2	0.047
HATCHERIES								
DWORSHAK H.	0	0	5	1	0	0	6	0.142
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	13	4	0	0	18	0.426
PERCENT OF RECOVERY %	0.0	5.6	72.2	22.2	0.0	0.0		

Appendix Table 1.2.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 16 to 18 April 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706B

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA2 2
Wire Codes Used: 231944

NUMBER RELEASED: 5136

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP	0	2	6	0	0	0	8	0.156
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	0	5	0	0	0	5	0.097
LOOKINGGLASS H.	0	0	1	0	0	0	1	0.019
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	2	12	0	0	0	14	0.273
PERCENT OF RECOVERY %	0.0	14.3	85.7	0.0	0.0	0.0		

Appendix Table 1.3.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 18 to 20 April 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706C

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RA2 3
Wire Codes Used: 231945

NUMBER RELEASED: 4636

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	1	0	0	2	0.043
LOWER GRANITE TRAP	0	2	15	1	0	0	18	0.388
OCEAN FISHERIES								
ALASKA	0	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	1	0	0	0	0	1	0.022
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	0	6	0	0	0	6	0.129
RAPID RIVER H.	0	0	3	0	0	0	3	0.065
KOOSKIA H.	0	0	1	0	0	0	1	0.022
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	3	26	2	0	0	31	0.669
PERCENT OF RECOVERY %	0.0	9.7	83.9	6.5	0.0	0.0		

Appendix Table 1.4.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 20 to 22 April 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706D

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA2 4
Wire Codes Used: 231946

NUMBER RELEASED: 4929

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	2	0	0	0	2	0.041
LOWER GRANITE TRAP	0	1	8	5	0	0	14	0.284
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	0	1	0	0	0	1	0.020
RAPID RIVER H.	0	0	1	0	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	12	5	0	0	18	0.365
PERCENT OF RECOVERY %	0.0	5.6	66.7	27.8	0.0	0.0		

Appendix Table 1.5.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 24 to 26 April 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706E

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA9 3
Wire Codes Used: 232018

NUMBER RELEASED: 4446

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	2	0	0	0	2	0.045
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES DWORSHAK H.	0	0	1	0	0	0	1	0.022
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	3	0	0	0	3	0.067
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 1.6.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 26 to 28 April 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706?

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA9 4
Wire Codes Used: 232019

NUMBER RELEASED: 4843

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP	0	0	1	0	0	0	1	0.021
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
RAPID RIVER H.	0	0	1	0	0	0	1	0.021
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	2	0	0	0	2	0.041
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 1.7.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 30 April to 1 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706G

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RASU1
Wire Codes Used: 232022

NUMBER RELEASED: 4815

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP	0	1	3	0	0	0	4	0.083
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
RAPID RIVER H.	0	0	1	0	0	0	1	0.021
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	4	0	0	0	5	0.104
PERCENT OF RECOVERY %	0.0	20.0	80.0	0.0	0.0	0.0		

Appendix Table 1.8.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 1 to 4 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706H

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RASU3
Wire Codes Used: 232029

NUMBER RELEASED: 5059

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	0	0	1	0.020
LOWER GRANITE TRAP	0	3	6	1	0	0	10	0.198
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	1	0	0	0	0	1	0.020
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	4	7	1	0	0	12	0.237
PERCENT OF RECOVERY %	0.0	33.3	58.3	8.3	0.0	0.0		

Appendix Table 1.9.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 4 to 12 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 87061

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RASU2
Wire Codes Used: 232023

NUMBER RELEASED: 2681

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	6	0	0	0	6	0.224
LOWER GRANITE TRAP	0	0	7	2	0	0	9	0.336
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
INDIAN CEREMONIAL	0	0	1	0	0	0	1	0.037
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	1	0	0	1	0.037
UNKNOWN	0	0	0	1	0	0	1	0.037
TOTALS	0	0	14	4	0	0	18	0.671
PERCENT OF RECOVERY %	0.0	0.0	77.8	22.2	0.0	0.0		

Appendix Table 1.10.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 12 to 13 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706J

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA9 1
Wire Codes Used: 231947

NUMBER RELEASED: 5070

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP	0	3	9	2	0	0	14	0.276
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	0	3	0	0	0	3	0.059
RAPID RIVER H.	0	0	2	0	0	0	2	0.039
LOOKINGGLASS H.	0	0	1	0	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	3	15	2	0	0	20	0.394
PERCENT OF RECOVERY %	0.0	15.0	75.0	10.0	0.0	0.0		

Appendix Table 1.11.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 15 to 27 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8706K

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RA9 2
Wire Codes Used: 231948

NUMBER RELEASED: 4366

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
LOWER GRANITE TRAP		0	0	5	1	0	0	6	0.137
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERY									
INDIAN CEREMONIAL		0	0	1	0	0	0	1	0.023
HATCHERIES									
RAPID RIVER H.		0	0	2	0	0	0	2	0.046
GENERAL		0	0	1	0	0	0	1	0.023
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	9	1	0	0	10	0.229
PERCENT OF RECOVERY	%	0.0	0.0	90.0	10.0	0.0	0.0		

Appendix Table 2.0.--Summary of all recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam in 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8907A 8907B 8907C 8907D 8907E 8907F 8907G 8907H 8907I 8907J 8907K 8907L

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used:	LA2 1	LA2 2	LA2 3	LA2 4	LART1	LART2	LART3	LART4	LA3 1	LA3 2	LA3 3	LA3 4
Wire Codes Used:	232256	232258	232349	232350	232351	232352	232411	232412	232413	232414	232415	232416

NUMBER RELEASED: 107176

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	1	1	0	2	0.002
LOWER GRANITE TRAP	0	2	15	0	17	0.016
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	1	0	0	1	0.001
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	4	16	0	20	0.019
PERCENT OF RECOVERY %	0.0	20.0	80.0	0.0		

Appendix Table 2.1.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 7 to 14 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8907A

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE
SPRING CHINOOK

Brands Used: LA2 1
Wire Codes Used: 232256

NUMBER RELEASED: 10016

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
LOWER GRANITE TRAP	0	1	2	0	3	0.030
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	1	0	0	1	0.010
STREAM SURVEY.	0	0	0	0	0	0.000
TOTALS	0	2	2	0	4	0.040
PERCENT OF RECOVERY %	0.0	50.0	50.0	0.0		

Appendix Table 2.2.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 17 to 18 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8907C

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE
SPRING CHINOOK

Brands Used: LA2 3
Wire Codes Used: 232349

NUMBER RELEASED: 9831

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	2	0	2	0.020
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	2	0	2	0.020
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 2.3.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 20 to 21 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8907D

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE
SPRING CHINOOK

Brands Used: LA2 4
Wire Codes Used: 232350

NUMBER RELEASED: 10043

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP		0	0	6	0	6	0.060
OCEAN FISHERIES		0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0.000
TOTALS		0	0	6	0	6	0.060
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0		

Appendix Table 2.4.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 21 to 22 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8907E

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LART1
Wire Codes Used: 232351

NUMBER RELEASED: 10184

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	1	2	0	3	0.029
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	2	0	3	0.029
PERCENT OF RECOVERY %	0.0	33.3	66.7	0.0		

Appendix Table 2.5.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 26 to 28 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 89071

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LA3 1
Wire Codes Used: 232413

NUMBER RELEASED: 10058

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP		0	0	1	0	1	0.010
LOWER GRANITE TRAP		0	0	1	0	1	0.010
OCEAN FISHERIES		0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0.000
TOTALS		0	0	2	0	2	0.020
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0		

Appendix Table 2.6.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 28 April to 11 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8907J

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE
SPRING CHINOOK

Brands Used: LA3 2
Wire Codes Used: 232414

NUMBER RELEASED: 10213

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	2	0	2	0.020
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	2	0	2	0.020
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 2.7.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam on 27 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8907L

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE
SPRING CHINOOK

Brands Used: LA3 4
Wire Codes Used: 232415

NUMBER RELEASED: 1129

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS BONNEVILLE TRAP	0	1	0	0	1	0.089
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	0	0	1	0.089
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 3.0.--Summary of all recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam in 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908A 8908B 8908C 8908D 8908E 8908F 8908G 8908H 8908I 8908J 8908K 8908L

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used:	RAF 1	RAF 2	RAF 3	RAF 4	RA9 1	RA9 2	RA9 3	RA9 4	RASU1	RASU2	RASU3	RASU4
Wire Codes Used:	232252	232259	232262	232309	232310	232311	232312	232313	232340	232354	232251	232251

NUMBER RELEASED: 75295

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	3	0	3	0.004
LOWER GRANITE TRAP	0	3	23	0	26	0.035
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	1	0	0	1	0.001
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	4	26	0	30	0.040
PERCENT OF RECOVERY %	0.0	13.3	86.7	0.0		

Appendix Table 3.1.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 11 to 13 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908A

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAF 1
Wire Codes Used: 232252

NUMBER RELEASED: 7083

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES - RAPID RIVER H.	0	1	0	0	1	0.014
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	0	0	1	0.014
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 3.2.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 15 to 17 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908B

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAF 2
Wire Codes Used: 232259

NUMBER RELEASED: 7439

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	3	0	3	0.040
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	3	0	3	0.040
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.3.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam on 18 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908C

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAF 3
Wire Codes Used: 232262

NUMBER RELEASED: 7057

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	1	1	0	2	0.028
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	1	0	2	0.028
PERCENT OF RECOVERY %	0.0	50.0	50.0	0.0		

Appendix Table 3.4.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 19 to 22 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908D

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAF 4
Wire Codes Used: 232309

NUMBER RELEASED: 7003

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	3	0	3	0.043
LOWER GRANITE TRAP	0	1	8	0	9	0.129
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	11	0	12	0.171
PERCENT OF RECOVERY %	0.0	8.3	91.7	0.0		

Appendix Table 3.5.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam on 22 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908E

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA9 1
Wire Codes Used: 232310

NUMBER RELEASED: 7019

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	2	0	2	0.028
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	2	0	2	0.028
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.6.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam on 23 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908F

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA9 2
Wire Codes Used: 232311

NUMBER RELEASED: 7155

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	2	0	2	0.028
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	2	0	2	0.028
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.7.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 24 to 25 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908G

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA9 3
Wire Codes Used: 232312

NUMBER RELEASED: 7100

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	2	0	2	0.028
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	2	0	2	0.028
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.8.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 25 to 26 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908H

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RA9 4
Wire Codes Used: 232313

NUMBER RELEASED: 7000

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	2	0	2	0.029
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	2	0	2	0.029
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.9.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 26 to 27 April 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 89081

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RASU1
Wire Codes Used: 232340

NUMBER RELEASED: 7095

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN.
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	1	0	1	0.014
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.014
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.10.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 1 to 10 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908J

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RASU2
Wire Codes Used: 232354

NUMBER RELEASED: 7000

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	1	0	1	0.014
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.014
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.11.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 10 to 25 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908K

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RA5U3
Wire Codes Used: 232251

NUMBER RELEASED: 3435

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	0	1	0	1	0.029
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.029
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.12.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam on 30 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8908L

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RASU4
Wire Codes Used: 232251

NUMBER RELEASED: 909

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	1	0	0	1	0.110
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	0	0	1	0.110
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 4.0.--Summary of all recoveries of adult steelhead transported as juveniles from Lower Granite Dam to below Bonneville Dam in 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8707A 8707B 8707C 8707D 8707E 8707F 8707G

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

STEELHEAD

Brands Used: RA2 1 RA2 2 RA2 3 RA2 4 RASU1 RASU2 RASU3
Wire Codes Used: 231943 231944 231945 231946 231947 231948 232030

NUMBER RELEASED: 27544

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	10	3	0	0	0	13	0.047
LOWER GRANITE TRAP	0	103	389	8	0	0	500	1.815
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	0	1	0.004
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	20	44	0	0	0	64	0.232
CLEARWATER R.	0	5	60	2	0	0	67	0.243
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
FALL INDIAN NET	0	0	1	0	0	0	1	0.004
CLEARWATER INDIAN	0	0	2	0	0	0	2	0.007
HATCHERIES								
DWORSHAK H.	0	2	52	1	0	0	55	0.200
PAHSIMEROI H.	0	3	4	0	0	0	7	0.025
RAPID RIVER H.	0	0	0	1	0	0	1	0.004
GENERAL	0	1	0	0	0	0	1	0.004
STREAM SURVEY	0	0	0	0	0	0	0	0.000
UNKNOWN	0	0	1	0	0	0	1	0.004
TOTALS	0	144	557	12	0	0	713	2.589
PERCENT OF RECOVERY %	0.0	20.2	78.1	1.7	0.0	0.0		

Appendix Table 4.1.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 16 to 30 April 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8707A

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

STEELHEAD

Brands Used: RA2 1
Wire Codes Used: 231943

NUMBER RELEASED: 3869

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	0	0	0	0	1	0.026
LOWER GRANITE TRAP	0	15	97	2	0	0	114	2.946
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	0	1	0.026
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	4	12	0	0	0	16	0.414
CLEARWATER R.	0	1	21	0	0	0	22	0.569
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
CLEARWATER INDIAN	0	0	2	0	0	0	2	0.052
HATCHERIES								
DWORSHAK H.	0	1	13	0	0	0	14	0.362
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	22	146	2	0	0	170	4.394
PERCENT OF RECOVERY %	0.0	12.9	85.9	1.2	0.0	0.0		

Appendix Table 4.2.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 30 April to 2 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8707B

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

STEELHEAD

Brands Used: RA2 2
Wire Codes Used: 231944

NUMBER RELEASED: 3829

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP	0	2	0	0	0	0	2	0.052
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
CLEARWATER R.	0	0	2	0	0	0	2	0.052
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	1	23	1	0	0	25	0.653
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	3	25	1	0	0	29	0.757
PERCENT OF RECOVERY %	0.0	10.3	86.2	3.4	0.0	0.0		

Appendix Table 4.3.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 2 to 7 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8707C

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

STEELHEAD

Brands Used: BA2 3
Wire Codes Used: 231945

NUMBER RELEASED: 4168

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	0	0	1	0.024
LOWER GRANITE TRAP	0	21	68	0	0	0	89	2.135
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	4	12	0	0	0	16	0.384
CLEARWATER R.	0	0	10	0	0	0	10	0.240
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	0	7	0	0	0	7	0.168
PAHSIMEROI H.	0	0	2	0	0	0	2	0.048
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	25	100	0	0	0	125	2.999
PERCENT OF RECOVERY %	0.0	20.0	80.0	0.0	0.0	0.0		

Appendix Table 4.4.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam on 7 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8707D

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

STEELHEAD

Brands Used: RA2 4
Wire Codes Used: 231946

NUMBER RELEASED: 2487

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	4	0	0	0	0	4	0.161
LOWER GRANITE TRAP	0	32	118	3	0	0	153	6.152
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	5	7	0	0	0	12	0.483
CLEARWATER R.	0	2	14	0	0	0	16	0.643
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	0	2	0	0	0	2	0.080
STREAM SURVEY	0	0	0	0	0	0	0	0.000
UNKNOWN	0	0	1	0	0	0	1	0.040
TOTALS	0	43	142	3	0	0	188	7.559
PERCENT OF RECOVERY %	0.0	22.9	75.5	1.6	0.0	0.0		

Appendix Table 4.5.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 8 to 12 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8707E

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE STEELHEAD

Brands Used: RASU1
Wire Codes Used: 231947

NUMBER RELEASED: 4298

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	4	2	0	0	0	6	0.140
LOWER GRANITE TRAP	0	19	63	0	0	0	82	1.908
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	4	3	0	0	0	7	0.163
CLEARWATER R.	0	1	5	0	0	0	6	0.140
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
FALL INDIAN NET	0	0	1	0	0	0	1	0.023
HATCHERIES								
DWORSHAK H.	0	0	5	0	0	0	5	0.116
PAHSIMEROI H.	0	3	0	0	0	0	3	0.070
RAPID RIVER H.	0	0	0	1	0	0	1	0.023
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	31	79	1	0	0	111	2.583
PERCENT OF RECOVERY %	0.0	27.9	71.2	0.9	0.0	0.0		

Appendix Table 4.6.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 13 to 14 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8707F

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

STEELHEAD

Brands Used: RA5U2
Wire Codes Used: 231948

NUMBER RELEASED: 4275

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP	0	7	23	2	0	0	32	0.749
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	1	8	0	0	0	9	0.211
CLEARWATER R.	0	0	2	1	0	0	3	0.070
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
PAHSIMEROI H.	0	0	2	0	0	0	2	0.047
GENERAL	0	1	0	0	0	0	1	0.023
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	9	35	3	0	0	47	1.099
PERCENT OF RECOVERY %	0.0	19.1	74.5	6.4	0.0	0.0		

Appendix Table 4.7.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 15 to 27 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8707G

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE

STEELHEAD

Brands Used: RASU3
Wire Codes Used: 232030

NUMBER RELEASED: 4618

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	0	0	0	0	1	0.022
LOWER GRANITE TRAP	0	7	20	1	0	0	28	0.606
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	2	2	0	0	0	4	0.087
CLEARWATER R.	0	1	6	1	0	0	8	0.173
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	0	2	0	0	0	2	0.043
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	11	30	2	0	0	43	0.931
PERCENT OF RECOVERY %	0.0	25.6	69.8	4.7	0.0	0.0		

Appendix Table 5.0.--Summary of all recoveries of adult steelhead released as juveniles below Little Goose Dam in 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8909A 8909B 8909C 8909D 8909E 8909F

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

STEELHEAD

Brands Used: LA3 1 LA3 2 LA3 3 LA3 4 LA2 1 LA2 2
Wire Codes Used: 232343 232345 232346 232347 232353 232028

NUMBER RELEASED: 42259

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	1	0	0	1	0.002
LOWER GRANITE TRAP	0	34	0	0	34	0.080
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	3	0	0	3	0.007
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
FALL INDIAN NET	0	2	0	0	2	0.005
HATCHERIES						
DWORSHAK H.	0	1	0	0	1	0.002
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	41	0	0	41	0.097
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 5.1.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 21 April to 2 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8909A

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

STEELHEAD

Brands Used: LA3 1
Wire Codes Used: 232343

NUMBER RELEASED: 7003

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
LOWER GRANITE TRAP	0	17	0	0	17	0.243
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	3	0	0	3	0.043
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
FALL INDIAN NET	0	1	0	0	1	0.014
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	21	0	0	21	0.300
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 5.2.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 4 to 6 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8909B

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE STEELHEAD

Brands Used: LA3 2
Wire Codes Used: 232345

NUMBER RELEASED: 7049

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP		0	10	0	0	10	0.142
OCEAN FISHERIES		0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0.000
HATCHERIES							
DWORSHAK H.		0	1	0	0	1	0.014
STREAM SURVEY		0	0	0	0	0	0.000
TOTALS		0	11	0	0	11	0.156
PERCENT OF RECOVERY	%	0.0	100.0	0.0	0.0		

Appendix Table 5.3.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 9 to 11 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8909C

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE STEELHEAD

Brands Used: LA3 3
Wire Codes Used: 232346

NUMBER RELEASED: 7088

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	1	0	0	1	0.014
LOWER GRANITE TRAP	0	4	0	0	4	0.056
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
FALL INDIAN NET	0	1	0	0	1	0.014
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	6	0	0	6	0.085
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 5.4.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 13 to 16 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8909D

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE STEELHEAD

Brands Used: LA3 4
Wire Codes Used: 232347

NUMBER RELEASED: 7000

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	2	0	0	2	0.029
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	0	0	2	0.029
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 5.5.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 18 to 20 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8909E

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE STEELHEAD

Brands Used: LA2 1
Wire Codes Used: 232353

NUMBER RELEASED: 7005

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	1	0	0	1	0.014
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	0	0	1	0.014
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 6.0.--Summary of all recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam in 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8910A 8910B 8910C 8910D 8910E 8910F

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RASU1 RASU2 RASU3 RASU4 RAF 1 RAF 2
Wire Codes Used: 232020 232021 232024 232026 232027 232355

NUMBER RELEASED: 30116

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
LOWER GRANITE TRAP	0	33	0	0	33	0.110
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	2	0	0	2	0.007
CLEARWATER R.	0	1	0	0	1	0.003
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
FALL INDIAN NET	0	2	0	0	2	0.007
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	38	0	0	38	0.126
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 6.1.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 25 April to 3 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8910A

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RASU1
Wire Codes Used: 232020

NUMBER RELEASED: 5000

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP		0	16	0	0	16	0.320
OCEAN FISHERIES		0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.		0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.		0	0	0	0	0	0.000
WENATCHEE R.		0	0	0	0	0	0.000
SNAKE R.		0	2	0	0	2	0.040
RIVER COMMERCIAL		0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0.000
TOTALS		0	18	0	0	18	0.360
PERCENT OF RECOVERY	%	0.0	100.0	0.0	0.0		

Appendix Table 6.2.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 3 to 5 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8910B

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE
STEELHEAD

Brands Used: RASU2
Wire Codes Used: 232021

NUMBER RELEASED: 5020

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP		0	5	0	0	5	0.100
OCEAN FISHERIES		0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0.000
INDIAN FISHERY FALL INDIAN NET		0	1	0	0	1	0.020
HATCHERIES		0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0.000
TOTALS		0	6	0	0	6	0.120
PERCENT OF RECOVERY	%	0.0	100.0	0.0	0.0		

Appendix Table 6.3.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 8 to 10 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8910C

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RA5U3
Wire Codes Used: 232024

NUMBER RELEASED: 5034

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
LOWER GRANITE TRAP	0	5	0	0	5	0.099
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
CLEARWATER R.	0	1	0	0	1	0.020
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
FALL INDIAN NET	0	1	0	0	1	0.020
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	7	0	0	7	0.139
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 6.4.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 12 to 15 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8910D

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE
STEELHEAD

Brands Used: RASU4
Wire Codes Used: 232026

NUMBER RELEASED: 5024

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	4	0	0	4	0.080
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	4	0	0	4	0.080
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 6.5.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 17 to 19 May 1989.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8910E

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAF 1
Wire Codes Used: 232027

NUMBER RELEASED: 5014

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP	0	3	0	0	3	0.060
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	3	0	0	3	0.060
PERCENT OF RECOVERY %	0.0	100.0	0.0	0.0		

Appendix Table 7.0.--Summary of all recoveries of adult spring chinook salmon released as juveniles below McNary Dam in 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8702A 8702B 8702C 8702D 8702E 8702F 8702G 8702H

1987 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAHE1 LAHE2 LAHE3 LAHE4 LART1 LART2 LART3 LART4
Wire Codes Used: 231949 231950 231951 231952 231953 231954 231955 231956

NUMBER RELEASED: 57902

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	17	1	0	0	19	0.033
LOWER GRANITE TRAP	0	1	6	0	0	0	7	0.012
PRIEST RAPIDS TRAP	0	0	11	6	0	0	17	0.029
OCEAN FISHERIES								
ALASKA	0	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	1	0	0	1	0.002
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	1	0	0	0	1	0.002
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	1	2	0	0	0	3	0.005
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	1	0	0	1	0.002
INDIAN CEREMONIAL	0	0	7	2	0	0	9	0.016
HATCHERIES								
DWORSHAK H.	0	0	2	0	0	0	2	0.003
RAPID RIVER H.	0	0	3	0	0	0	3	0.005
LEAVENWORTH H.	0	0	5	2	0	0	7	0.012
ENTIAT H.	0	0	4	1	0	0	5	0.009
STREAM SURVEY								
GENERAL	0	0	1	2	0	0	3	0.005
UNKNOWN	0	0	1	1	0	0	2	0.003
TOTALS	0	3	60	17	0	0	80	0.138
PERCENT OF RECOVERY %	0.0	3.8	75.0	21.3	0.0	0.0		

Appendix Table 7.1.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 21 April to 4 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8702A

1987 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAHE1
Wire Codes Used: 231949

NUMBER RELEASED: 7365

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	8	0	0	0	8	0.109
LOWER GRANITE TRAP	0	0	2	0	0	0	2	0.027
PRIEST RAPIDS TRAP	0	0	1	0	0	0	1	0.014
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
INDIAN CEREMONIAL	0	0	2	0	0	0	2	0.027
HATCHERIES								
RAPID RIVER H.	0	0	1	0	0	0	1	0.014
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	14	0	0	0	14	0.190
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 7.2.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 4 to 7 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8702B

1987 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAHE2
Wire Codes Used: 231950

NUMBER RELEASED: 7501

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	4	0	0	0	4	0.053
LOWER GRANITE TRAP	0	0	1	0	0	0	1	0.013
PRIEST RAPIDS TRAP	0	0	6	1	0	0	7	0.093
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	0	0	1	0.013
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	0	1	0	0	0	1	0.013
STREAM SURVEY	0	0	0	0	0	0	0	0.000
UNKNOWN	0	0	1	0	0	0	1	0.013
TOTALS	0	0	14	1	0	0	15	0.200
PERCENT OF RECOVERY %	0.0	0.0	93.3	6.7	0.0	0.0		

Appendix Table 7.3.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 7 to 10 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8702C

1987 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAHE3
Wire Codes Used: 231951

NUMBER RELEASED: 7500

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	2	1	0	0	3	0.040
LOWER GRANITE TRAP	0	0	1	0	0	0	1	0.013
PRIEST RAPIDS TRAP	0	0	0	2	0	0	2	0.027
OCEAN FISHERIES								
ALASKA	0	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	1	0	0	1	0.013
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
INDIAN CEREMONIAL	0	0	1	0	0	0	1	0.013
HATCHERIES								
RAPID RIVER H.	0	0	2	0	0	0	2	0.027
LEAVENWORTH H.	0	0	1	0	0	0	1	0.013
ENTIAT H.	0	0	3	0	0	0	3	0.040
STREAM SURVEY								
GENERAL	0	0	0	2	0	0	2	0.027
UNKNOWN	0	0	0	1	0	0	1	0.013
TOTALS	0	0	10	7	0	0	17	0.227
PERCENT OF RECOVERY %	0.0	0.0	58.8	41.2	0.0	0.0		

Appendix Table 7.4.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 10 to 13 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8702D

1987 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAHE4
Wire Codes Used: 231952

NUMBER RELEASED: 7500

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	0	0	0	0	1	0.013
LOWER GRANITE TRAP	0	1	2	0	0	0	3	0.040
PRIEST RAPIDS TRAP	0	0	2	0	0	0	2	0.027
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	1	1	0	0	0	2	0.027
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
INDIAN CEREMONIAL	0	0	1	1	0	0	2	0.027
HATCHERIES								
DWORSHAK H.	0	0	1	0	0	0	1	0.013
LEAVENWORTH H.	0	0	1	1	0	0	2	0.027
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	3	8	2	0	0	13	0.173
PERCENT OF RECOVERY %	0.0	23.1	61.5	15.4	0.0	0.0		

Appendix Table 7.5.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 13 to 17 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8702K

1987 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LART1
Wire Codes Used: 231953

NUMBER RELEASED: 7501

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
PRIEST RAPIDS TRAP		0	0	0	3	0	0	3	0.040
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERY									
INDIAN GENERAL		0	0	0	1	0	0	1	0.013
INDIAN CEREMONIAL		0	0	0	1	0	0	1	0.013
HATCHERIES									
LEAVENWORTH H.		0	0	1	0	0	0	1	0.013
ENTIAT H.		0	0	1	1	0	0	2	0.027
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	2	6	0	0	8	0.107
PERCENT OF RECOVERY	%	0.0	0.0	25.0	75.0	0.0	0.0		

Appendix Table 7.6.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 18 to 23 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8702F

1987 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LART2
Wire Codes Used: 231954

NUMBER RELEASED: 7505

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES - LEAVENWORTH H.	0	0	0	1	0	0	1	0.013
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	0	1	0	0	1	0.013
PERCENT OF RECOVERY %	0.0	0.0	0.0	100.0	0.0	0.0		

Appendix Table 7.7.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 23 to 27 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8702G

1987 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LART3
Wire Codes Used: 231955

NUMBER RELEASED: 7501

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS BONNEVILLE TRAP	0	0	1	0	0	0	1	0.013
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY INDIAN CEREMONIAL	0	0	2	0	0	0	2	0.027
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	3	0	0	0	3	0.040
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 7.8.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 27 May to 4 June 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8702H

1987 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LART4
Wire Codes Used: 231956

NUMBER RELEASED: 5529

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	2	0	0	0	2	0.036
PRIEST RAPIDS TRAP	0	0	2	0	0	0	2	0.036
OCEAN FISHERIES								
ALASKA	0	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	1	0	0	0	1	0.018
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
INDIAN CEREMONIAL	0	0	1	0	0	0	1	0.018
HATCHERIES								
LEAVENWORTH H.	0	0	2	0	0	0	2	0.036
STREAM SURVEY								
GENERAL	0	0	1	0	0	0	1	0.018
TOTALS	0	0	9	0	0	0	9	0.163
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 8.0.--Summary of all recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam in 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8701A 8701B 8701C 8701D 8701E 8701F 8701G 8701H

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAPI1 RAPI2 RAPI3 RAPI4 RA3 1 RA3 2 RA3 3 RA3 4
Wire Codes Used: 232008 232009 232010 232011 232012 232013 232014 232015

NUMBER RELEASED: 38487

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	11	2	0	0	14	0.036
LOWER GRANITE TRAP	0	0	4	2	0	0	6	0.016
PRIEST RAPIDS TRAP	0	0	17	4	0	0	21	0.055
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.003
BRITISH COLUMBIA	0	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	1	0	0	0	0	1	0.003
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	5	5	3	0	0	13	0.034
SNAKE R.	0	0	0	0	0	0	0	0.000
OTHER RIVERS	0	0	0	1	0	0	1	0.003
RIVER COMMERCIAL								
COL. R. TEST FSHRY (ORE)	0	0	0	1	0	0	1	0.003
INDIAN FISHERY								
WINTER INDIAN NET	0	0	0	2	0	0	2	0.005
INDIAN CEREMONIAL	0	0	3	2	0	0	5	0.013
HATCHERIES								
DWORSHAK H.	0	1	2	0	0	0	3	0.008
RAPID RIVER H.	0	0	1	0	0	0	1	0.003
WELLS H.	0	0	1	0	0	0	1	0.003
WINTHROP H.	0	0	1	0	0	0	1	0.003
LEAVENWORTH H.	0	0	4	12	0	0	16	0.042
ENTIAT H.	0	0	1	1	0	0	2	0.005
STREAM SURVEY								
GENERAL	0	0	2	0	0	0	2	0.005
UNKNOWN	0	0	1	0	0	0	1	0.003
TOTALS	0	8	53	31	0	0	92	0.239
PERCENT OF RECOVERY %	0.0	8.7	57.6	33.7	0.0	0.0		

Appendix Table 8.1.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 21 April to 4 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8701A

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAPI1
Wire Codes Used: 232008

NUMBER RELEASED: 4957

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	2	0	0	0	3	0.061
PRIEST RAPIDS TRAP	0	0	2	0	0	0	2	0.040
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	1	2	0	0	0	3	0.061
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	2	6	0	0	0	8	0.161
PERCENT OF RECOVERY %	0.0	25.0	75.0	0.0	0.0	0.0		

Appendix Table 8.2.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 4 to 7 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8701B

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAPI2
Wire Codes Used: 232009

NUMBER RELEASED: 5000

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	0	0	1	0.020
LOWER GRANITE TRAP	0	0	1	1	0	0	2	0.040
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
LEAVENWORTH H.	0	0	0	1	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	2	2	0	0	4	0.080
PERCENT OF RECOVERY %	0.0	0.0	50.0	50.0	0.0	0.0		

Appendix Table 8.3.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 7 to 10 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8701C

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAPI3
Wire Codes Used: 232010

NUMBER RELEASED: 5000

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	3	2	0	0	5	0.100
LOWER GRANITE TRAP	0	0	3	0	0	0	3	0.060
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	1	2	0	0	0	3	0.060
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
INDIAN CEREMONIAL	0	0	1	0	0	0	1	0.020
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
UNKNOWN	0	0	1	0	0	0	1	0.020
TOTALS	0	1	10	2	0	0	13	0.260
PERCENT OF RECOVERY %	0.0	7.7	76.9	15.4	0.0	0.0		

Appendix Table 8.4.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 10 to 13 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8701D

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAPI4
Wire Codes Used: 232011

NUMBER RELEASED: 5003

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	1	1	0	0	0	2	0.040
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
RAPID RIVER H.	0	0	1	0	0	0	1	0.020
LEAVENWORTH H.	0	0	0	1	0	0	1	0.020
STREAM SURVEY								
GENERAL	0	0	1	0	0	0	1	0.020
TOTALS	0	1	3	1	0	0	5	0.100
PERCENT OF RECOVERY %	0.0	20.0	60.0	20.0	0.0	0.0		

Appendix Table 8.5.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 13 to 17 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8701E

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA3 1
Wire Codes Used: 232012

NUMBER RELEASED: 5000

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	3	0	0	0	3	0.060
PRIEST RAPIDS TRAP	0	0	9	3	0	0	12	0.240
OCEAN FISHERIES								
ALASKA	0	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	1	0	0	0	0	1	0.020
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	1	2	1	0	0	4	0.080
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
LEAVENWORTH H.	0	0	1	6	0	0	7	0.140
ENTIAT H.	0	0	1	1	0	0	2	0.040
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	2	16	11	0	0	29	0.580
PERCENT OF RECOVERY %	0.0	6.9	55.2	37.9	0.0	0.0		

Appendix Table 8.6.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 17 to 22 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8701F

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RA3 2
Wire Codes Used: 232013

NUMBER RELEASED: 5002

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	0	0	1	0.020
PRIEST RAPIDS TRAP	0	0	2	0	0	0	2	0.040
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.020
BRITISH COLUMBIA	0	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	1	0	0	0	0	1	0.020
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
WINTER INDIAN NET	0	0	0	1	0	0	1	0.020
HATCHERIES								
LEAVENWORTH H.	0	0	1	3	0	0	4	0.080
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	4	5	0	0	10	0.200
PERCENT OF RECOVERY %	0.0	10.0	40.0	50.0	0.0	0.0		

Appendix Table 8.7.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 23 to 27 May 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8701G

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA3 3
Wire Codes Used: 232014

NUMBER RELEASED: 5000

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	0	0	1	0.020
PRIEST RAPIDS TRAP	0	0	2	0	0	0	2	0.040
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	1	0	0	1	0.020
SNAKE R.	0	0	0	0	0	0	0	0.000
OTHER RIVERS	0	0	0	1	0	0	1	0.020
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
WINTER INDIAN NET	0	0	0	1	0	0	1	0.020
INDIAN CEREMONIAL	0	0	1	2	0	0	3	0.060
HATCHERIES								
WELLS H.	0	0	1	0	0	0	1	0.020
LEAVENWORTH H.	0	0	1	1	0	0	2	0.040
STREAM SURVEY								
GENERAL	0	0	1	0	0	0	1	0.020
TOTALS	0	0	7	6	0	0	13	0.260
PERCENT OF RECOVERY %	0.0	0.0	53.8	46.2	0.0	0.0		

Appendix Table 8.8.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 27 May to 3 June 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8701H

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA3 4
Wire Codes Used: 232015

NUMBER RELEASED: 3525

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP	0	0	0	1	0	0	1	0.028
PRIEST RAPIDS TRAP	0	0	2	1	0	0	3	0.085
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	1	0	1	0	0	2	0.057
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COL. R. TEST FSHRY (ORE)	0	0	0	1	0	0	1	0.028
INDIAN FISHERY								
INDIAN CEREMONIAL	0	0	1	0	0	0	1	0.028
HATCHERIES								
WINTHROP H.	0	0	1	0	0	0	1	0.028
LEAVENWORTH H.	0	0	1	0	0	0	1	0.028
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	5	4	0	0	10	0.284
PERCENT OF RECOVERY %	0.0	10.0	50.0	40.0	0.0	0.0		

Appendix Table 9.0.--Summary of recoveries of adult spring chinook salmon released as juveniles below McNary Dam in 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8802A 8802B 8802C 8802D 8802E 8802F 8802G 8802H 8802I 8802J

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAW 1 LAW 2 LAW 3 LAW 4 LAP 1 LAP 2 LAP 3 LAP 4 LAE 1 LAE 2
Wire Codes Used: 232226 232227 232228 232229 232230 232231 232232 232233 232234 232235

NUMBER RELEASED: 75036

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	1	23	5	0	29	0.039
LOWER GRANITE TRAP	0	1	6	1	0	8	0.011
PRIEST RAPIDS TRAP	0	1	14	0	0	15	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	5	0	0	5	0.007
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
INDIAN CEREMONIAL	0	0	4	0	0	4	0.005
HATCHERIES							
RAPID RIVER H.	0	1	0	0	0	1	0.001
TUCANNON H.	0	0	1	0	0	1	0.001
LYONS FERRY H.	0	0	1	0	0	1	0.001
LEAVENWORTH H.	0	0	5	0	0	5	0.007
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	4	59	6	0	69	0.092
PERCENT OF RECOVERY %	0.0	5.8	85.5	8.7	0.0		

Appendix Table 9.1.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 8 to 16 April 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8802A

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAW 1
Wire Codes Used: 232226

NUMBER RELEASED: 7504

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	7	5	0	12	0.160
PRIEST RAPIDS TRAP	0	0	5	0	0	5	0.067
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	0	1	0.013
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
INDIAN CEREMONIAL	0	0	1	0	0	1	0.013
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	14	5	0	19	0.253
PERCENT OF RECOVERY %	0.0	0.0	73.7	26.3	0.0		

Appendix Table 9.2.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 16 April to 1 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8802B

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAW 2
Wire Codes Used: 232227

NUMBER RELEASED: 7500

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	1	10	0	0	11	0.147
LOWER GRANITE TRAP	0	1	1	0	0	2	0.027
PRIEST RAPIDS TRAP	0	0	4	0	0	4	0.053
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	0	1	0.013
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES							
RAPID RIVER H.	0	1	0	0	0	1	0.013
TUCANNON H.	0	0	1	0	0	1	0.013
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	3	17	0	0	20	0.267
PERCENT OF RECOVERY %	0.0	15.0	85.0	0.0	0.0		

Appendix Table 9.3.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 1 to 6 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8802C

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAW 3
Wire Codes Used: 232228

NUMBER RELEASED: 7503

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	3	0	0	3	0.040
LOWER GRANITE TRAP	0	0	2	0	0	2	0.027
PRIEST RAPIDS TRAP	0	1	1	0	0	2	0.027
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
INDIAN CEREMONIAL	0	0	1	0	0	1	0.013
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	1	7	0	0	8	0.107
PERCENT OF RECOVERY %	0.0	12.5	87.5	0.0	0.0		

Appendix Table 9.4.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 6 to 8 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8802D

1988 MCNARY TRANS CONTROL BELOW MCNARY
SPRING CHINOOK

Brands Used: LAW 4
Wire Codes Used: 232229

NUMBER RELEASED: 7534

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP		0	0	1	0	0	1	0.013
LOWER GRANITE TRAP		0	0	2	1	0	3	0.040
PRIEST RAPIDS TRAP		0	0	1	0	0	1	0.013
OCEAN FISHERIES		0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
LEAVENWORTH H.		0	0	3	0	0	3	0.040
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	7	1	0	8	0.106
PERCENT OF RECOVERY	%	0.0	0.0	87.5	12.5	0.0		

Appendix Table 9.5.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 8 to 10 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8802K

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAP 1
Wire Codes Used: 232230

NUMBER RELEASED: 7503

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	1	0	0	1	0.013
PRIEST RAPIDS TRAP	0	0	1	0	0	1	0.013
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	2	0	0	2	0.027
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES							
LEAVENWORTH H.	0	0	1	0	0	1	0.013
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	5	0	0	5	0.067
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 9.6.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 10 to 12 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8802F

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAP 2
Wire Codes Used: 232231

NUMBER RELEASED: 7482

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
INDIAN CEREMONIAL	0	0	1	0	0	1	0.013
HATCHERIES							
LYONS FERRY H.	0	0	1	0	0	1	0.013
LEAVENWORTH H.	0	0	1	0	0	1	0.013
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	3	0	0	3	0.040
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 9.7.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 15 to 19 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8802H

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAP 4
Wire Codes Used: 232233

NUMBER RELEASED: 7505

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS BONNEVILLE TRAP		0	0	1	0	0	1	0.013
OCEAN FISHERIES		0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0.000
INDIAN FISHERY INDIAN CEREMONIAL		0	0	1	0	0	1	0.013
HATCHERIES		0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	2	0	0	2	0.027
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	0.0		

Appendix Table 9.8.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 19 to 24 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8802I

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAR 1
Wire Codes Used: 232234

NUMBER RELEASED: 7502

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS PRIEST RAPIDS TRAP	0	0	1	0	0	1	0.013
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	1	0	0	1	0.013
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 9.9.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 25 May to 2 June 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8802J

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAK 2
Wire Codes Used: 232235

NUMBER RELEASED: 7502

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	0	1	0	0	1	0.013
PRIEST RAPIDS TRAP	0	0	1	0	0	1	0.013
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	0	1	0.013
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	3	0	0	3	0.040
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 10.0.--Summary of all recoveries of adult spring chinook salmon transported by barge from McNary Dam to below Bonneville Dam in 1988.

Master File Date.: 22 July 1991
RELEASE GROUPS INCLUDED: 8801A 8801B 8801C 8801D 8801E 8801F 8801G 8801H 8801I 8801J

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 1 RAL 2 RAL 3 RAL 4 RAV 1 RAV 2 RAV 3 RAV 4 RAS 1 RAS 2
Wire Codes Used: 232236 232237 232238 232239 232240 232241 232242 232243 232244 232245

NUMBER RELEASED: 50028

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	2	17	2	0	21	0.042
LOWER GRANITE TRAP	0	3	5	2	0	10	0.020
PRIEST RAPIDS TRAP	0	0	10	0	0	10	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	2	0	0	2	0.004
WENATCHEE R..	0	0	4	0	0	4	0.008
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
INDIAN CEREMONIAL	0	0	3	0	0	3	0.006
HATCHERIES							
DWORSHAK H.	0	0	3	0	0	3	0.006
RAPID RIVER H.	0	0	1	0	0	1	0.002
LEAVENWORTH H.	0	1	6	0	0	7	0.014
ENTIAT H.	0	0	1	0	0	1	0.002
STREAM SURVEY							
GENERAL	0	0	1	0	0	1	0.002
UNKNOWN	0	0	1	0	0	1	0.002
TOTALS	0	6	54	4	0	64	0.128
PERCENT OF RECOVERY %	0.0	9.4	84.4	6.3	0.0		

Appendix Table 10.1.--Recoveries of adult spring chinook salmon transported as juvenile by barge from McNary Dam to below Bonneville Dam from 8 to 16 April 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8801A

1988 MCNARY TRANS BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAL 1
Wire Codes Used: 232236

NUMBER RELEASED: 5001

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	1	7	1	0	9	0.180
PRIEST RAPIDS TRAP	0	0	2	0	0	2	0.040
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	2	0	0	2	0.040
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	1	11	1	0	13	0.260
PERCENT OF RECOVERY %	0.0	7.7	84.6	7.7	0.0		

Appendix Table 10.2.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 16 April to 1 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8801B

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 2
Wire Codes Used: 232237

NUMBER RELEASED: 5002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	6	0	0	6	0.120
LOWER GRANITE TRAP	0	0	2	0	0	2	0.040
PRIEST RAPIDS TRAP	0	0	5	0	0	5	0.100
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES							
DWORSHAK H.	0	0	2	0	0	2	0.040
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	15	0	0	15	0.300
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 10.3.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 1 to 6 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8801C

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 3
Wire Codes Used: 232238

NUMBER RELEASED: 5002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	0	1	0	1	0.020
PRIEST RAPIDS TRAP	0	0	1	0	0	1	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	0	1	0.020
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
INDIAN CEREMONIAL	0	0	2	0	0	2	0.040
HATCHERIES							
RAPID RIVER H.	0	0	1	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	5	1	0	6	0.120
PERCENT OF RECOVERY %	0.0	0.0	83.3	16.7	0.0		

Appendix Table 10.4.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 6 to 8 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8801D

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 4
Wire Codes Used: 232239

NUMBER RELEASED: 5011

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	1	0	0	1	0.020
LOWER GRANITE TRAP	0	0	1	0	0	1	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	1	0	0	1	0.020
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES							
LEAVENWORTH H.	0	0	1	0	0	1	0.020
ENTIAT H.	0	0	1	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	5	0	0	5	0.100
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 10.5.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 8 to 10 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8801E

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAV 1
Wire Codes Used: 232240

NUMBER RELEASED: 5002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	2	1	1	0	4	0.080
OCEAN FISHERIES		0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.		0	0	1	0	0	1	0.020
LEAVENWORTH H.		0	0	2	0	0	2	0.040
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	2	4	1	0	7	0.140
PERCENT OF RECOVERY	%	0.0	28.6	57.1	14.3	0.0		

Appendix Table 10.6.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dan from 10 to 12 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8801P

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAV 2
Wire Codes Used: 232241

NUMBER RELEASED: 5002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	0	1	0	0	1	0.020
PRIEST RAPIDS TRAP	0	0	1	0	0	1	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
UNKNOWN	0	0	1	0	0	1	0.020
TOTALS	0	0	3	0	0	3	0.060
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 10.7.--Recoveries of adult spring chihook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 12 to 15 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8801G

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAV 3
Wire Codes Used: 232242

NUMBER RELEASED: 5001

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY INDIAN CEREMONIAL	0	0	1	0	0	1	0.020
HATCHERIES LEAVENWORTH H.	0	1	2	0	0	3	0.060
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	1	3	0	0	4	0.080
PERCENT OF RECOVERY %	0.0	25.0	75.0	0.0	0.0		

Appendix Table 10.8.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 15 to 19 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8801H

1988 MCNARY TRANS BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAV 4
Wire Codes Used: 232243

NUMBER RELEASED: 5003

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	1	0	0	1	0.020
LOWER GRANITE TRAP	0	1	0	0	0	1	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	1	1	0	0	2	0.040
PERCENT OF RECOVERY %	0.0	50.0	50.0	0.0	0.0		

Appendix Table 10.9.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 19 to 25 May 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8801I

1988 MCNARY TRANS BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAS 1
Wire Codes Used: 232244

NUMBER RELEASED: 5002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP		0	0	2	0	0	2	0.040
LOWER GRANITE TRAP		0	0	0	1	0	1	0.020
OCEAN FISHERIES		0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
LEAVENWORTH H.		0	0	1	0	0	1	0.020
STREAM SURVEY								
GENERAL		0	0	1	0	0	1	0.020
TOTALS		0	0	4	1	0	5	0.100
PERCENT OF RECOVERY	%	0.0	0.0	80.0	20.0	0.0		

Appendix Table 10.10.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville dam from 25 May to 2 June 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 88013

1988 MCNARY TRANS BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAS 2
Wire Codes Used: 232245

NUMBER RELEASED: 5002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	1	0	0	0	1	0.020
PRIEST RAPIDS TRAP	0	0	1	0	0	1	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	2	0	0	2	0.040
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	1	3	0	0	4	0.080
PERCENT OF RECOVERY %	0.0	25.0	75.0	0.0	0.0		

Appendix Table 11.0.--Summary of all recoveries of adult fall chinook salmon released as juveniles below McNary Dam in 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615A 8615B 8615C 8615D 8615E 8615F 8615G 8615H 8615I 8615J 8615K 8615L

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA1T3 LA3X3 LA3J3 LA3C3 LA3L3 LA7H3 LA1Q3 LA7H1 LA1D1 LA1T1 LA3X1 LA3L1
Wire Codes Used: 231921 231923 231925 231927 231929 231931 231933 231935 231937 231939 231941 231844

NUMBER RELEASED: 115991

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	4	0	11	0	15	0.013
PRIEST RAPIDS TRAP	0	3	0	0	0	0	3	0.003
OCEAN FISHERIES								
ALASKA	0	0	1	11	13	0	25	0.022
BRITISH COLUMBIA	0	1	3	11	5	0	20	0.017
WASHINGTON	0	0	2	2	2	0	6	0.005
OREGON	0	0	5	0	0	0	5	0.004
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	1	0	0	1	0.001
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	1	0	2	0.002
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	7	3	0	10	0.009
COL. R. TEST FSHRY (ORE)	0	0	0	1	0	0	1	0.001
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	0	2	0	2	0.002
FALL INDIAN NET	0	0	0	16	17	0	33	0.028
HATCHERIES								
LYONS FERRY H.	0	0	0	1	0	0	1	0.001
WELLS H.	0	0	0	1	2	0	3	0.003
PRIEST RAPIDS H.	0	0	8	16	10	0	34	0.029
STREAM SURVEY								
GENERAL	0	1	0	0	0	0	1	0.001
TOTALS	0	6	23	67	66	0	162	0.140
PERCENT OF RECOVERY %	0.0	3.7	14.2	41.4	40.7	0.0		

Appendix Table 11.1.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 11 to 18 June 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615A

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA173
Wire Codes Used: 231921

NUMBER RELEASED: 9969

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
PRIEST RAPIDS TRAP	0	1	0	0	0	0	1	0.010
OCEAN FISHERIES								
ALASKA	0	0	0	1	1	0	2	0.020
BRITISH COLUMBIA	0	0	0	0	2	0	2	0.020
WASHINGTON	0	0	0	0	1	0	1	0.010
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	0	0	2	0.020
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	3	1	0	4	0.040
HATCHERIES								
PRIEST RAPIDS H.	0	0	0	1	2	0	3	0.030
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	0	7	7	0	15	0.150
PERCENT OF RECOVERY %	0.0	6.7	0.0	46.7	46.7	0.0		

Appendix Table 11.2.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 18 to 21 June 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615B

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3X3
Wire Codes Used: 231923

NUMBER RELEASED: 9982

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	1	0	1	0	2	0.020
OCEAN FISHERIES									
ALASKA		0	0	0	1	1	0	2	0.020
BRITISH COLUMBIA		0	0	0	1	0	0	1	0.010
WASHINGTON		0	0	0	0	0	0	0	0.000
OREGON		0	0	0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	0	0	1	0	1	0.010
INDIAN FISHERY									
INDIAN GENERAL		0	0	0	0	1	0	1	0.010
FALL INDIAN NET		0	0	0	2	2	0	4	0.040
HATCHERIES									
WELLS H.		0	0	0	0	1	0	1	0.010
PRIEST RAPIDS H.		0	0	2	2	2	0	6	0.060
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	3	6	9	0	18	0.180
PERCENT OF RECOVERY	%	0.0	0.0	16.7	33.3	50.0	0.0		

Appendix table 11.3.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 21 to 27 June 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615C

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3J3
Wire Codes Used: 231925

NUMBER RELEASED: 9972

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	1	0	2	0.020
PRIEST RAPIDS TRAP	0	1	0	0	0	0	1	0.010
OCEAN FISHERIES								
ALASKA	0	0	0	2	2	0	4	0.040
BRITISH COLUMBIA	0	0	0	3	0	0	3	0.030
WASHINGTON	0	0	1	0	0	0	1	0.010
OREGON	0	0	1	0	0	0	1	0.010
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	0	0	1	0.010
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	2	1	0	3	0.030
HATCHERIES								
WELLS H.	0	0	0	1	0	0	1	0.010
PRIEST RAPIDS H.	0	0	1	1	1	0	3	0.030
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	4	10	5	0	20	0.201
PERCENT OF RECOVERY %	0.0	5.0	20.0	50.0	25.0	0.0		

Appendix Table 11.4.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 27 June to 8 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615D

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3C3
Wire Codes Used: 231927

NUMBER RELEASED: 10745

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	2	0	2	0.019
PRIEST RAPIDS TRAP	0	1	0	0	0	0	1	0.009
OCEAN FISHERIES								
ALASKA	0	0	0	2	1	0	3	0.028
BRITISH COLUMBIA	0	0	1	3	0	0	4	0.037
WASHINGTON	0	0	0	1	0	0	1	0.009
OREGON	0	0	3	0	0	0	3	0.028
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	0	1	0	1	0.009
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
LYONS FERRY H.	0	0	0	1	0	0	1	0.009
PRIEST RAPIDS H.	0	0	3	6	2	0	11	0.102
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	7	13	6	0	27	0.251
PERCENT OF RECOVERY %	0.0	3.7	25.9	48.1	22.2	0.0		

Appendix Table 11.5.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 9 to 15 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615E

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3L3
Wire Codes Used: 231929

NUMBER RELEASED: 9937

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	1	0	1	0.010
OCEAN FISHERIES								
ALASKA	0	0	0	1	1	0	2	0.020
BRITISH COLUMBIA	0	0	1	0	0	0	1	0.010
WASHINGTON	0	0	0	0	1	0	1	0.010
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	1	0	1	0.010
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	0	0	1	0.010
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	1	5	0	6	0.060
HATCHERIES								
PRIEST RAPIDS H.	0	0	1	1	2	0	4	0.040
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	2	4	12	0	18	0.181
PERCENT OF RECOVERY %	0.0	0.0	11.1	22.2	66.7	0.0		

Appendix Table 11.6.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 15 to 19 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615F

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA7H3
Wire Codes Used: 231931

NUMBER RELEASED: 9949

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	2	0	3	0.030
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA	0	1	0	1	0	0	2	0.020
WASHINGTON	0	0	1	0	0	0	1	0.010
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	1	0	0	1	0.010
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	1	4	0	5	0.050
HATCHERIES								
WELLS H.	0	0	0	0	1	0	1	0.010
PRIEST RAPIDS H.	0	0	1	5	0	0	6	0.060
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	3	9	7	0	20	0.201
PERCENT OF RECOVERY %	0.0	5.0	15.0	45.0	35.0	0.0		

Appendix Table 11.7.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 19 to 21 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615G

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA103
Wire Codes Used: 231933

NUMBER RELEASED: 9968

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	2	0	3	0.030
OCEAN FISHERIES								
ALASKA	0	0	0	1	2	0	3	0.030
BRITISH COLUMBIA	0	0	1	0	1	0	2	0.020
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	1	0	0	0	1	0.010
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	0	0	1	0.010
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	1	0	0	1	0.010
HATCHERIES:								
PRIEST RAPIDS H.	0	0	0	0	1	0	1	0.010
STREAM SURVEY								
GENERAL	0	1	0	0	0	0	1	0.010
TOTALS	0	2	3	2	6	0	13	0.130
PERCENT OF RECOVERY %	0.0	15.4	23.1	15.4	46.2	0.0		

Appendix Table 11.8.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 21 to 22 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615H

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA7H1
Wire Codes Used: 231935

NUMBER RELEASED: 9850

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES									
ALASKA		0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA		0	0	0	1	1	0	2	0.020
WASHINGTON		0	0	0	0	0	0	0	0.000
OREGON		0	0	0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COL. R. TEST FSHRY (ORE)		0	0	0	1	0	0	1	0.010
INDIAN FISHERY									
FALL INDIAN NET		0	0	0	1	1	0	2	0.020
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	0	4	2	0	6	0.061
PERCENT OF RECOVERY	%	0.0	0.0	0.0	66.7	33.3	0.0		

Appendix Table 11.9.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 22 to 23 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 86151

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA101
Wire Codes Used: 231937

NUMBER RELEASED: 9867

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	1	0	1	0.010
OCEAN FISHERIES								
ALASKA	0	0	0	0	3	0	3	0.030
BRITISH COLUMBIA	0	0	0	0	1	0	1	0.010
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	0	0	1	0.010
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	2	1	0	3	0.030
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	0	3	6	0	9	0.091
PERCENT OF RECOVERY %	0.0	0.0	0.0	33.3	66.7	0.0		

Appendix Table 11.10.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 23 to 28 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615J

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA171
Wire Codes Used: 231939

NUMBER RELEASED: 9978

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES								
ALASKA	0	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	1	0	0	1	0.010
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	0	0	2	0.020
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	1	1	0	2	0.020
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	0	4	1	0	5	0.050
PERCENT OF RECOVERY %	0.0	0.0	0.0	80.0	20.0	0.0		

Appendix Table 11.11.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 29 July to 1 August 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615K

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3X1
Wire Codes Used: 231941

NUMBER RELEASED: 9976

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	1	0	1	0.010
OCEAN FISHERIES								
ALASKA	0	0	1	0	2	0	3	0.030
BRITISH COLUMBIA	0	0	0	1	0	0	1	0.010
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	0	1	0	1	0.010
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	2	1	0	3	0.030
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	1	3	5	0	9	0.090
PERCENT OF RECOVERY %	0.0	0.0	11.1	33.3	55.6	0.0		

Appendix Table 11.12.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 1 to 7 August 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8615L

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3L1
Wire Codes Used: 231844

NUMBER RELEASED: 5798

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.017
BRITISH COLUMBIA	0	0	0	1	0	0	1	0.017
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	0	2	0	0	2	0.034
PERCENT OF RECOVERY %	0.0	0.0	0.0	100.0	0.0	0.0		

Appendix Table 12.0.--Summary of all recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam in 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616A 8616B 8616C 8616D 8616E 8616F 8616G 8616H 8616I 8616J 8616K 8616L

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA171 RA3X1 RA3J1 RA3C1 RA3L1 RA7H1 RA101 RA7H3 RA103 RA173 RA3J3 RA3C3
Wire Codes Used: 231922 231924 231926 231928 231930 231932 231934 231936 231938 231940 231942 231832

NUMBER RELEASED: 114653

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	4	0	56	0	60	0.052
LOWER GRANITE TRAP	0	0	0	0	1	0	1	0.001
PRIEST RAPIDS TRAP	0	8	0	0	0	0	8	0.007
OCEAN FISHERIES								
ALASKA	0	0	2	18	42	0	62	0.054
BRITISH COLUMBIA	0	2	6	22	38	0	68	0.059
WASHINGTON	0	0	5	2	4	0	11	0.010
OREGON	0	0	15	0	0	0	15	0.013
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	2	0	0	0	2	0.002
COLUMBIA R. ABOVE SNAKE R.	0	3	0	0	5	0	8	0.007
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	3	0	17	17	0	37	0.032
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	0	7	0	7	0.006
FALL INDIAN NET	0	0	0	36	62	0	98	0.085
HATCHERIES								
LYONS FERRY H.	0	0	0	3	1	0	4	0.003
WELLS H.	0	0	1	2	3	0	6	0.005
PRIEST RAPIDS H.	0	0	8	22	11	0	41	0.036
STREAM SURVEY								
GENERAL	0	0	0	4	1	0	5	0.004
TOTALS	0	16	43	126	248	0	433	0.378
PERCENT OF RECOVERY %	0.0	3.7	9.9	29.1	57.3	0.0		

Appendix Table 12.1.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 11 to 18 June 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616A

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA171
Wire Codes Used: 231922

NUMBER RELEASED: 9974

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	0	0	3	0	3	0.030
PRIEST RAPIDS TRAP		0	1	0	0	0	0	1	0.010
OCEAN FISHERIES									
ALASKA		0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA		0	0	0	3	1	0	4	0.040
WASHINGTON		0	0	0	0	1	0	1	0.010
OREGON		0	0	1	0	0	0	1	0.010
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERY									
FALL INDIAN NET		0	0	0	3	1	0	4	0.040
HATCHERIES									
PRIEST RAPIDS H.		0	0	0	0	1	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	1	1	7	7	0	16	0.160
PERCENT OF RECOVERY	%	0.0	6.3	6.3	43.8	43.8	0.0		

Appendix Table 12.2.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville dam from 18 to 21 June 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616B

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3X1
Wire Codes Used: 231924

NUMBER RELEASED: 9981

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES									
ALASKA		0	0	0	0	0	0	0	0.000
BRITISH COLUMBIA		0	0	0	2	0	0	2	0.020
WASHINGTON		0	0	0	0	0	0	0	0.000
OREGON		0	0	1	0	0	0	1	0.010
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES									
PRIEST RAPIDS H.		0	0	1	0	0	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	2	2	0	0	4	0.040
PERCENT OF RECOVERY	%	0.0	0.0	50.0	50.0	0.0	0.0		

Appendix Table 12.3.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 21 to 27 June 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616C

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3J1
Wire Codes Used: 231926

NUMBER RELEASED: 9971

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA	0	0	0	0	3	0	3	0.030
WASHINGTON	0	0	0	1	0	0	1	0.010
OREGON	0	0	2	0	0	0	2	0.020
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	1	1	0	2	0.020
HATCHERIES								
WELLS H.	0	0	0	1	1	0	2	0.020
PRIEST RAPIDS H.	0	0	2	1	0	0	3	0.030
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	4	5	5	0	14	0.140
PERCENT OF RECOVERY %	0.0	0.0	28.6	35.7	35.7	0.0		

Appendix Table 12.4.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 27 June to 8 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616D

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3C1
Wire Codes Used: 231928

NUMBER RELEASED: 10745

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	6	0	6	0.056
PRIEST RAPIDS TRAP	0	1	0	0	0	0	1	0.009
OCEAN FISHERIES								
ALASKA	0	0	0	0	4	0	4	0.037
BRITISH COLUMBIA	0	0	0	1	2	0	3	0.028
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	3	0	0	0	3	0.028
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	0	1	0.009
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	0	0	2	0.019
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	0	2	0	2	0.019
FALL INDIAN NET	0	0	0	3	7	0	10	0.093
HATCHERIES								
LYONS FERRY H.	0	0	0	3	0	0	3	0.028
PRIEST RAPIDS H.	0	0	1	5	5	0	11	0.102
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	5	14	26	0	46	0.428
PERCENT OF RECOVERY %	0.0	2.2	10.9	30.4	56.5	0.0		

Appendix Table 12.5.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 9 to 15 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616E

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3LI
Wire Codes Used: 231930

NUMBER RELEASED: 9959

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	2	0	2	0.020
LOWER GRANITE TRAP	0	0	0	0	1	0	1	0.010
PRIEST RAPIDS TRAP	0	2	0	0	0	0	2	0.020
OCEAN FISHERIES								
ALASKA	0	0	1	2	2	0	5	0.050
BRITISH COLUMBIA	0	0	0	2	6	0	8	0.080
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	4	0	0	0	4	0.040
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	0	0	1	0.010
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	1	0	2	1	0	4	0.040
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	8	3	0	11	0.110
HATCHERIES								
LYONS FERRY H.	0	0	0	0	1	0	1	0.010
WELLS H.	0	0	0	0	1	0	1	0.010
PRIEST RAPIDS H.	0	0	0	7	1	0	8	0.080
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	4	5	21	19	0	49	0.492
PERCENT OF RECOVERY %	0.0	8.2	10.2	42.9	38.8	0.0		

Appendix Table 12.6.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 15 to 19 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616F

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA7H1
Wire Codes Used: 231932

NUMBER RELEASED: 9972

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	2	0	3	0	5	0.050
PRIEST RAPIDS TRAP	0	1	0	0	0	0	1	0.010
OCEAN FISHERIES								
ALASKA	0	0	1	0	3	0	4	0.040
BRITISH COLUMBIA	0	1	2	7	6	0	16	0.160
WASHINGTON	0	0	2	0	0	0	2	0.020
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	3	1	0	4	0.040
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	1	3	0	4	0.040
HATCHERIES								
WELLS H.	0	0	0	0	1	0	1	0.010
PRIEST RAPIDS H.	0	0	0	2	2	0	4	0.040
STREAM SURVEY								
GENERAL	0	0	0	2	0	0	2	0.020
TOTALS	0	2	7	15	19	0	43	0.431
PERCENT OF RECOVERY %	0.0	4.7	16.3	34.9	44.2	0.0		

Appendix Table 12.7.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 19 to 21 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616G

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA101
Wire Codes Used: 231934

NUMBER RELEASED: 9953

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	11	0	11	0.111
PRIEST RAPIDS TRAP	0	1	0	0	0	0	1	0.010
OCEAN FISHERIES								
ALASKA	0	0	0	3	8	0	11	0.111
BRITISH COLUMBIA	0	0	2	3	2	0	7	0.070
WASHINGTON	0	0	1	0	0	0	1	0.010
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	0	0	1	0.010
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	0	0	2	0.020
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	6	13	0	19	0.191
HATCHERIES								
PRIEST RAPIDS H.	0	0	1	2	0	0	3	0.030
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	2	4	16	35	0	57	0.573
PERCENT OF RECOVERY %	0.0	3.5	7.0	28.1	61.4	0.0		

Appendix Table 12.8.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 21 to 22 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616H

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA7H3
Wire Codes Used: 231936

NUMBER RELEASED: 9840

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	7	0	8	0.081
OCEAN FISHERIES								
ALASKA	0	0	0	1	4	0	5	0.051
BRITISH COLUMBIA	0	1	0	0	4	0	5	0.051
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	2	0	0	0	2	0.020
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	1	0	1	0.010
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	5	0	7	0.071
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	0	6	0	6	0.061
HATCHERIES								
PRIEST RAPIDS H.	0	0	1	2	0	0	3	0.030
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	4	5	28	0	38	0.386
PERCENT OF RECOVERY %	0.0	2.6	10.5	13.2	73.7	0.0		

Appendix Table 12.9.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 22 to 23 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 86161

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA103
Wire Codes Used: 231938

NUMBER RELEASED: 9906

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	10	0	10	0.101
OCEAN FISHERIES								
ALASKA	0	0	0	5	6	0	11	0.111
BRITISH COLUMBIA	0	0	0	1	4	0	5	0.050
WASHINGTON	0	0	1	0	0	0	1	0.010
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	0	1	0.010
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	3	0	3	0.030
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	0	0	1	0.010
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	2	4	0	6	0.061
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	2	9	28	0	39	0.394
PERCENT OF RECOVERY %	0.0	0.0	5.1	23.1	71.8	0.0		

Appendix Table 12.10.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 23 to 28 July 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616J

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA173
Wire Codes Used: 231940

NUMBER RELEASED: 9938

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	5	0	5	0.050
OCEAN FISHERIES								
ALASKA	0	0	0	4	7	0	11	0.111
BRITISH COLUMBIA	0	0	1	2	1	0	4	0.040
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	1	0	2	0.020
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	1	0	2	4	0	7	0.070
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	8	9	0	17	0.171
HATCHERIES								
PRIEST RAPIDS H.	0	0	1	0	1	0	2	0.020
STREAM SURVEY								
GENERAL	0	0	0	2	1	0	3	0.030
TOTALS	0	2	2	18	29	0	51	0.513
PERCENT OF RECOVERY %	0.0	3.9	3.9	35.3	56.9	0.0		

Appendix Table 12.11:--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 29 July to 1 August 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616K

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3J3
Wire Codes Used: 231942

NUMBER RELEASED: 9887

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	0	0	9	0	9	0.091
PRIEST RAPIDS TRAP		0	2	0	0	0	0	2	0.020
OCEAN FISHERIES									
ALASKA		0	0	0	0	5	0	5	0.051
BRITISH COLUMBIA		0	0	1	1	8	0	10	0.101
WASHINGTON		0	0	0	1	3	0	4	0.040
OREGON		0	0	2	0	0	0	2	0.020
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	1	0	1	6	0	8	0.081
INDIAN FISHERY									
INDIAN GENERAL		0	0	0	0	1	0	1	0.010
FALL INDIAN NET		0	0	0	3	12	0	15	0.152
HATCHERIES									
WELLS H.		0	0	1	1	0	0	2	0.020
PRIEST RAPIDS H.		0	0	1	3	1	0	5	0.051
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	3	5	10	45	0	63	0.637
PERCENT OF RECOVERY	%	0.0	4.8	7.9	15.9	71.4	0.0		

Appendix Table 12.12.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 1 to 7 August 1986.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8616L

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3C3
Wire Codes Used: 231832

NUMBER RELEASED: 4527

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	0	0	1	0.022
OCEAN FISHERIES								
ALASKA	0	0	0	1	3	0	4	0.088
BRITISH COLUMBIA	0	0	0	0	1	0	1	0.022
WASHINGTON	0	0	1	0	0	0	1	0.022
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	0	0	2	0.044
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	1	3	0	4	0.088
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	2	4	7	0	13	0.287
PERCENT OF RECOVERY %	0.0	0.0	15.4	30.8	53.8	0.0		

Appendix Table 13.0.--Summary of all recoveries of adult fall chinook salmon released as juveniles below McNary Dam in 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8708A 8708B 8708C 8708D 8708E 8708F 8708G

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIX1 LAIX3 LA2C1 LA2C3 LA2J1 LA2J3 LAIJ1
Wire Codes Used: 232002 232003 232004 232005 232006 232007 231957

NUMBER RELEASED: 68291

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	8	0	17	0	0	25	0.037
OCEAN FISHERIES								
ALASKA	0	0	1	8	0	0	9	0.013
BRITISH COLUMBIA	0	1	1	7	0	0	9	0.013
WASHINGTON	0	1	0	1	0	0	2	0.003
OREGON	0	2	0	0	0	0	2	0.003
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	1	0	0	0	0	1	0.001
COLUMBIA R. ABOVE SNAKE R.	0	0	0	1	0	0	1	0.001
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	0	0	2	0.003
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	3	0	0	3	0.004
FALL INDIAN NET	0	0	1	11	0	0	12	0.018
HATCHERIES								
LYONS FERRY H.	0	0	0	1	0	0	1	0.001
PRIEST RAPIDS H.	0	4	4	5	0	0	13	0.019
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	17	7	56	0	0	80	0.117
PERCENT OF RECOVERY %	0.0	21.3	8.8	70.0	0.0	0.0		

Appendix Table 13.1.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 18 to 23 June 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8708A

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIX1
Wire Codes Used: 232002

NUMBER RELEASED: 10000

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	2	0	0	2	0.020
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA	0	0	1	0	0	0	1	0.010
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	1	0	0	1	0.010
HATCHERIES								
PRIEST RAPIDS H.	0	0	1	2	0	0	3	0.030
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	2	6	0	0	8	0.080
PERCENT OF RECOVERY %	0.0	0.0	25.0	75.0	0.0	0.0		

Appendix Table 13.2.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 23 to 25 June 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 87038

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIX3
Wire Codes Used: 232003

NUMBER RELEASED: 9146

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	2	0	0	2	0.022
OCEAN FISHERIES								
ALASKA	0	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	1	0	0	1	0.011
WASHINGTON	0	1	0	0	0	0	1	0.011
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	1	0	0	1	0.011
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	1	0	0	1	0.011
FALL INDIAN NET	0	0	0	2	0	0	2	0.022
HATCHERIES								
PRIEST RAPIDS H.	0	2	2	0	0	0	4	0.044
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	3	2	7	0	0	12	0.131
PERCENT OF RECOVERY %	0.0	25.0	16.7	58.3	0.0	0.0		

Appendix Table 13.3.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 25 June to 1 July 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8708C

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2C1
Wire Codes Used: 232004

NUMBER RELEASED: 9753

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	0	1	0	0	1	0.010
OCEAN FISHERIES									
ALASKA		0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA		0	0	0	1	0	0	1	0.010
WASHINGTON		0	0	0	1	0	0	1	0.010
OREGON		0	0	0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERY									
INDIAN GENERAL		0	0	0	1	0	0	1	0.010
HATCHERIES									
PRIEST RAPIDS H.		0	0	1	0	0	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	1	5	0	0	6	0.062
PERCENT OF RECOVERY	%	0.0	0.0	16.7	83.3	0.0	0.0		

Appendix Table 13.4.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 1 to 8 July 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8708D

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2C3
Wire Codes Used: 232005

NUMBER RELEASED: 10000

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	2	0	3	0	0	5	0.050
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA	0	1	0	2	0	0	3	0.030
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	1	0	0	0	0	1	0.010
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	1	0	0	0	0	1	0.010
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	0	0	1	0.010
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	1	0	0	1	0.010
FALL INDIAN NET	0	0	1	3	0	0	4	0.040
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	5	1	11	0	0	17	0.170
PERCENT OF RECOVERY %	0.0	29.4	5.9	64.7	0.0	0.0		

Appendix Table 13.5.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 8 to 14 July 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8708E

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2J1
Wire Codes Used: 232006

NUMBER RELEASED: 10000

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	0	4	0	0	5	0.050
OCEAN FISHERIES								
ALASKA	0	0	1	2	0	0	3	0.030
BRITISH COLUMBIA	0	0	0	1	0	0	1	0.010
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	2	0	0	2	0.020
HATCHERIES								
PRIEST RAPIDS H.	0	0	0	1	0	0	1	0.010
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	1	10	0	0	12	0.120
PERCENT OF RECOVERY %	0.0	8.3	8.3	83.3	0.0	0.0		

Appendix Table 13.6.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 15 to 30 July 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8708F

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2J3
Wire Codes Used: 232007

NUMBER RELEASED: 9392

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	3	0	0	3	0.032
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.011
BRITISH COLUMBIA	0	0	0	2	0	0	2	0.021
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	1	0	0	0	0	1	0.011
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
FALL INDIAN NET	0	0	0	3	0	0	3	0.032
HATCHERIES								
PRIEST RAPIDS H.	0	0	0	1	0	0	1	0.011
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	0	10	0	0	11	0.117
PERCENT OF RECOVERY %	0.0	9.1	0.0	90.9	0.0	0.0		

Appendix Table 13.7.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 30 July to 13 August 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8708G

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIJ1
Wire Codes Used: 231957

NUMBER RELEASED: 10000

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	5	0	2	0	0	7	0.070
OCEAN FISHERIES								
ALASKA	0	0	0	2	0	0	2	0.020
BRITISH COLUMBIA	0	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	0	0	1	0.010
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
LYONS FERRY H.	0	0	0	1	0	0	1	0.010
PRIEST RAPIDS H.	0	2	0	1	0	0	3	0.030
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	7	0	7	0	0	14	0.140
PERCENT OF RECOVERY %	0.0	50.0	0.0	50.0	0.0	0.0		

Appendix Table 14.0.--Summary of all recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam in 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8709A 8709B 8709C 8709D 8709E 8709F 8709G

1987 MCNARY TRANS TEST/TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA141 RA143 RAIR1 RAIR3 RAIS1 RAIS3 RAIK1
Wire Codes Used: 231959 231960 231961 231962 231963 232001 232016

NUMBER RELEASED: 68376

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	24	0	38	0	0	62	0.091
OCEAN FISHERIES								
ALASKA	0	1	3	27	0	0	31	0.045
BRITISH COLUMBIA	0	2	7	36	0	0	45	0.066
WASHINGTON	0	4	1	1	0	0	6	0.009
OREGON	0	1	1	1	0	0	3	0.004
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	2	0	0	2	0.003
WENATCHEE R.	0	1	1	0	0	0	2	0.003
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	5	10	0	0	15	0.022
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	3	0	0	3	0.004
FALL INDIAN NET	0	0	7	46	0	0	53	0.078
HATCHERIES								
LYONS FERRY H.	0	0	1	0	0	0	1	0.001
WELLS H.	0	0	1	0	0	0	1	0.001
PRIEST RAPIDS H.	0	6	6	7	0	0	19	0.028
SPRING CREEK H.	0	0	0	1	0	0	1	0.001
STREAM SURVEY								
GENERAL	0	0	2	1	0	0	3	0.004
UNKNOWN	0	0	0	0	1	0	1	0.001
TOTALS	0	39	35	173	1	0	248	0.363
PERCENT OF RECOVERY %	0.0	15.7	14.1	69.8	0.4	0.0		

Appendix Table 14.1.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 18 to 23 June 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8709A

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA141
Wire Codes Used: 231959

NUMBER RELEASED: 10003

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	0	6	0	0	7	0.070
OCEAN FISHERIES								
ALASKA	0	0	1	3	0	0	4	0.040
BRITISH COLUMBIA	0	1	2	10	0	0	13	0.130
WASHINGTON	0	1	0	0	0	0	1	0.010
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	2	0	0	2	0.020
WENATCHEE R.	0	1	1	0	0	0	2	0.020
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERY								
FALL INDIAN NET	0	0	3	9	0	0	12	0.120
HATCHERIES								
PRIEST RAPIDS H.	0	1	2	2	0	0	5	0.050
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	5	9	32	0	0	46	0.460
PERCENT OF RECOVERY %	0.0	10.9	19.6	69.6	0.0	0.0		

Appendix Table 14.2.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 23 to 25 June 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8709B

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA143
Wire Codes Used: 231960

NUMBER RELEASED: 9146

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	0	3	0	0	3	0.033
OCEAN FISHERIES									
ALASKA		0	0	0	3	0	0	3	0.033
BRITISH COLUMBIA		0	0	1	2	0	0	3	0.033
WASHINGTON		0	0	0	0	0	0	0	0.000
OREGON		0	0	0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	1	0	0	0	1	0.011
INDIAN FISHERY									
FALL INDIAN NET		0	0	0	1	0	0	1	0.011
HATCHERIES									
LYONS FERRY H.		0	0	1	0	0	0	1	0.011
STREAM SURVEY		0	0	0	0	0	0	0	0.000
UNKNOWN		0	0	0	0	1	0	1	0.011
TOTALS		0	0	3	9	1	0	13	0.142
PERCENT OF RECOVERY	%	0.0	0.0	23.1	69.2	7.7	0.0		

Appendix Table 14.3.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 25 June to 1 July 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8709C

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIR1
Wire Codes Used: 231961

NUMBER RELEASED: 9834

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	1	0	3	0	0	4	0.041
OCEAN FISHERIES									
ALASKA		0	0	1	3	0	0	4	0.041
BRITISH COLUMBIA		0	0	1	2	0	0	3	0.031
WASHINGTON		0	0	0	0	0	0	0	0.000
OREGON		0	0	0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	2	1	0	0	3	0.031
INDIAN FISHERY									
INDIAN GENERAL		0	0	0	1	0	0	1	0.010
FALL INDIAN NET		0	0	0	2	0	0	2	0.020
HATCHERIES									
PRIEST RAPIDS H.		0	0	2	0	0	0	2	0.020
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	1	6	12	0	0	19	0.193
PERCENT OF RECOVERY	%	0.0	5.3	31.6	63.2	0.0	0.0		

Appendix Table 14.4.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 1 to 8 July 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8709D

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIR3
Wire Codes Used: 231962

NUMBER RELEASED: 10001

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	2	0	1	0	0	3	0.030
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA	0	0	0	2	0	0	2	0.020
WASHINGTON	0	0	0	0	0	0	0	0.000
OREGON	0	0	0	1	0	0	1	0.010
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	0	0	1	0.010
INDIAN FISHERY								
FALL INDIAN NET	0	0	1	3	0	0	4	0.040
HATCHERIES								
PRIEST RAPIDS H.	0	1	2	2	0	0	5	0.050
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	3	3	11	0	0	17	0.170
PERCENT OF RECOVERY %	0.0	17.6	17.6	64.7	0.0	0.0		

Appendix Table 14.5.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 8 to 14 July 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8709E

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIS1
Wire Codes Used: 231963

NUMBER RELEASED: 10000

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	4	0	6	0	0	10	0.100
OCEAN FISHERIES									
ALASKA		0	0	0	4	0	0	4	0.040
BRITISH COLUMBIA		0	1	0	2	0	0	3	0.030
WASHINGTON		0	0	0	0	0	0	0	0.000
OREGON		0	0	1	0	0	0	1	0.010
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	0	1	0	0	1	0.010
INDIAN FISHERY									
FALL INDIAN NET		0	0	0	4	0	0	4	0.040
HATCHERIES									
PRIEST RAPIDS H.		0	0	0	1	0	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	5	1	18	0	0	24	0.240
PERCENT OF RECOVERY	%	0.0	20.8	4.2	75.0	0.0	0.0		

Appendix Table 14.6.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 15 to 30 July 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8709F

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIS3
Wire Codes Used: 232001

NUMBER RELEASED: 9392

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	5	0	10	0	0	15	0.160
OCEAN FISHERIES									
ALASKA		0	1	1	6	0	0	8	0.085
BRITISH COLUMBIA		0	0	1	7	0	0	8	0.085
WASHINGTON		0	0	1	0	0	0	1	0.011
OREGON		0	1	0	0	0	0	1	0.011
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	1	1	0	0	2	0.021
INDIAN FISHERY									
INDIAN GENERAL		0	0	0	1	0	0	1	0.011
FALL INDIAN NET		0	0	1	7	0	0	8	0.085
HATCHERIES									
PRIEST RAPIDS H.		0	1	0	0	0	0	1	0.011
STREAM SURVEY									
GENERAL		0	0	1	0	0	0	1	0.011
TOTALS		0	8	6	32	0	0	46	0.490
PERCENT OF RECOVERY	%	0.0	17.4	13.0	69.6	0.0	0.0		

Appendix Table 14.7.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 30 July to 14 August 1987.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8709G

1987 MCNARY TRANS TEST/TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIK1
Wire Codes Used: 232016

NUMBER RELEASED: 10000

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	11	0	9	0	0	20	0.200
OCEAN FISHERIES								
ALASKA	0	0	0	7	0	0	7	0.070
BRITISH COLUMBIA	0	0	2	11	0	0	13	0.130
WASHINGTON	0	3	0	1	0	0	4	0.040
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	1	6	0	0	7	0.070
INDIAN FISHERY								
INDIAN GENERAL	0	0	0	1	0	0	1	0.010
FALL INDIAN NET	0	0	2	20	0	0	22	0.220
HATCHERIES								
WELLS H.	0	0	1	0	0	0	1	0.010
PRIEST RAPIDS H.	0	3	0	2	0	0	5	0.050
SPRING CREEK H.	0	0	0	1	0	0	1	0.010
STREAM SURVEY								
GENERAL	0	0	1	1	0	0	2	0.020
TOTALS	0	17	7	59	0	0	83	0.830
PERCENT OF RECOVERY %	0.0	20.5	8.4	71.1	0.0	0.0		

Appendix Table 15.0.--Summary of all recoveries of adult fall chinook salmon released as juveniles below McNary Dam in 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8804A 8804B 8804C 8804D 8804E 8804F 8804G

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIT1 LAIT2 LAIT3 LAIT4 LA2X1 LA2X3 LAIC1
Wire Codes Used: 232246 232247 232248 232249 232250 232048 232049

NUMBER RELEASED: 60010

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	2	0	0	2	0.003
OCEAN FISHERIES							
ALASKA	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	1	0	0	1	0.002
WASHINGTON	0	0	0	0	0	0	0.000
OREGON	0	0	1	0	0	1	0.002
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL							
COMMERCIAL NET	0	0	1	0	0	1	0.002
INDIAN FISHERY							
FALL INDIAN NET	0	0	2	0	0	2	0.003
HATCHERIES							
PRIEST RAPIDS H.	0	1	0	0	0	1	0.002
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	1	7	0	0	8	0.013
PERCENT OF RECOVERY %	0.0	12.5	87.5	0.0	0.0		

Appendix Table 15.1.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 13 to 21 June 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8804A

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIT1
Wire Codes Used: 232246

NUMBER RELEASED: 10002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	1	0	0	1	0.010
OCEAN FISHERIES							
ALASKA	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0.000
OREGON	0	0	1	0	0	1	0.010
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
FALL INDIAN NET	0	0	1	0	0	1	0.010
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	3	0	0	3	0.030
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 15.2.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 23 to 26 June 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8804C

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIT3
Wire Codes Used: 232248

NUMBER RELEASED: 10002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP		0	0	1	0	0	1	0.010
OCEAN FISHERIES		0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0.000
INDIAN FISHERY								
FALL INDIAN NET		0	0	1	0	0	1	0.010
HATCHERIES								
PRIEST RAPIDS H.		0	1	0	0	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	1	2	0	0	3	0.030
PERCENT OF RECOVERY	%	0.0	33.3	66.7	0.0	0.0		

Appendix Table 15.3.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 27 June to 1 July 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8804D

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIT4
Wire Codes Used: 232249

NUMBER RELEASED: 10002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	1	0	0	1	0.010
WASHINGTON	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	1	0	0	1	0.010
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 15.4.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 13 to 14 July 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8804F

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2X3
Wire Codes Used: 232048

NUMBER RELEASED: 5008

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL COMMERCIAL NET	0	0	1	0	0	1	0.020
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	1	0	0	1	0.020
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 16.0.--Summary of all recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam in 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8803A 8803B 8803C 8803D 8803E 8803F

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIU1 RAIU2 RAIU3 RAIU4 RAID1 RAID3
Wire Codes Used: 232260 232261 232301 232302 232303 232304

NUMBER RELEASED: 60013

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	3	0	0	3	0.005
OCEAN FISHERIES							
ALASKA	0	0	3	0	0	3	0.005
BRITISH COLUMBIA	0	1	1	0	0	2	0.003
WASHINGTON	0	0	1	0	0	1	0.002
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL							
COMMERCIAL NET	0	1	0	0	0	1	0.002
INDIAN FISHERY							
INDIAN GENERAL	0	0	1	0	0	1	0.002
HATCHERIES							
PRIEST RAPIDS H.	0	1	0	0	0	1	0.002
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	3	9	0	0	12	0.020
PERCENT OF RECOVERY %	0.0	25.0	75.0	0.0	0.0		

Appendix Table 16.1.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 13 to 21 June 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8803A

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: BAIU1
Wire Codes Used: 232260

NUMBER RELEASED: 10002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS BONNEVILLE TRAP	0	0	2	0	0	2	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	2	0	0	2	0.020
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 16.2.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 21 to 23 June 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8803B

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIU2
Wire Codes Used: 232261

NUMBER RELEASED: 10003

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA	0	0	1	0	0	1	0.010
BRITISH COLUMBIA	0	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	1	0	0	1	0.010
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 16.3.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 23 to 26 June 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8803C

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIU3
Wire Codes Used: 232301

NUMBER RELEASED: 10002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	1	0	0	1	0.010
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
INDIAN GENERAL	0	0	1	0	0	1	0.010
HATCHERIES							
PRIEST RAPIDS H.	0	1	0	0	0	1	0.010
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	1	2	0	0	3	0.030
PERCENT OF RECOVERY %	0.0	33.3	66.7	0.0	0.0		

Appendix Table 16.4.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 5 to 13 July 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8803E

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAID1
Wire Codes Used: 232303

NUMBER RELEASED: 10002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA	0	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	1	0	0	1	0.010
WASHINGTON	0	0	1	0	0	1	0.010
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	2	0	0	2	0.020
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 16.5.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 13 to 21 July 1988.

Master File Date : 22 July 1991
RELEASE GROUPS INCLUDED: 8803F

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAID3
Wire Codes Used: 232304

NUMBER RELEASED: 10002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA	0	0	2	0	0	2	0.020
BRITISH COLUMBIA	0	1	0	0	0	1	0.010
WASHINGTON	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL							
COMMERCIAL NET	0	1	0	0	0	1	0.010
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	2	2	0	0	4	0.040
PERCENT OF RECOVERY %	0.0	50.0	50.0	0.0	0.0		

Appendix Table 17.0--Summary of tagging dates, numbers collected, tagged, and released, and maximum, minimum, and average lengths and weights of wild/natural chinook salmon parr, PIT-tagged in various streams of Idaho and Oregon, in August/September, 1990.

	IDAHO										OREGON			
STREAM	BEAR VALLEY	ELK CREEK	VALLEY CREEK	CAPE HORN CREEK	MARSH CREEK	EAST FORK SALMON R.	SOUTH FORK SALMON R.	BIG CREEK	SECESH RIVER	OVERALL TOTALS/	LOSTINE RIVER	CATHERINE CREEK	IMNAHA RIVER	OVERALL TOTALS/ AVERAGES
TAGGING DATES	8/2 TO 8/5	8/5 TO 8/7	8/8 TO 8/10	8/11 TO 8/12	8/11 TO 8/13	8/15 TO 8/16	8/19 TO 8/20	8/22 TO 8/23	8/26 TO 8/27	8/2 TO 8/27	9/18 TO 9/19	9/20 TO 9/21	9/25	9/18 TO 9/25
TOTAL NUMBER COLLECTED	358	257	1089	175	889	573	1024	749	1131	6245	1019	1018	346	2383
TOTAL NUMBER TAGGED	352	247	1030	164	861	533	990	726	1018	5921	1017	1013	334	2364
TOTAL NUMBER TAGGED FISH RELEASED	352	247	1023	164	861	532	986	724	1016	5905	1006	1012	327	2345
MAXIMUM LENGTH OF TAGGED FISH	88	89	104	100	96	99	88	96	96	104	104	104	99	104
MINIMUM LENGTH OF TAGGED FISH	52	63	50	55	55	58	52	51	49	49	58	58	56	56
AVERAGE LENGTH OF TAGGED FISH	69	76	68	69	71	78	65	67	61	68	77	80	69	77
MAXIMUM WEIGHT OF TAGGED FISH	9.4	10.1	12.9	12.7	9.7	14.2	7.5	11.6	11.3	14.2	6.2	9.9	11.1	11.1
MINIMUM WEIGHT OF TAGGED FISH	1.6	3.2	1.6	2.1	2.0	2.8	1.0	1.2	1.3	1.0	3.5	3.9	1.6	1.6
AVERAGE WEIGHT OF TAGGED FISH	4.7	6.1	4.3	4.6	4.9	6.3	3.4	4.2	2.9	4.2	4.8	6.3	3.9	4.2

Appendix Table 18.0.—Summary of collecting methods, collecting mortality, post-tagging mortality, 24h post-tagging mortality, tag loss, maximum, minimum and average lengths and weights of tagging mortality, of wild/natural chinook salmon parr, PIT-tagged in various streams of Idaho and Oregon, August - September, 1990.

	IDAHO										OREGON			
STREAM	BEAR VALLEY CREEK	ELK CREEK	VALLEY CREEK	CAPE HORN CREEK	MARSH CREEK	EAST FORK SALMON R.	SOUTH FORK SALMON R.	BIG CREEK	SECESH RIVER	OVERALL TOTALS/ AVERAGES	LOSTINE RIVER	CATHERINE CREEK	IMNAHA RIVER	OVERALL TOTALS/ AVERAGES
COLLECTING METHOD	SHOCK	SHOCK	SEINE/ SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK		SEINE	SEINE/ SHOCK	BOX TRAP	
NUMBER COLLECTION MORTALITY	4	3	12	6	11	36	10	7	5	94	1	5	—	6
PERCENT COLLECTION MORTALITY	1.1	1.2	1.1	3.4	1.2	6.3	1.0	1.0	0.4	1.5	0.1	0.5	—	0.3
NUMBER (1/2-3H) POST-TAGGING MORTALITY	0	0	7	0	0	0	4	2	1	14	8	0	7	15
PERCENT (1/2-3H) POST-TAGGING MORTALITY	0	0	0.7	0	0	0	0.4	0.3	0.1	0.2	0.8	0	2.1	0.6
NUMBER HELD 24H POST-TAGGING MORTALITY AND TAG LOSS	115	0	89	141	242	175	180	221	96	1259	282	165	0	447
NUMBER 24H POSTTAGGING MORTALITY	0	—	0	0	0	1	0	0	1	2	3	1	—	4
PERCENT 24H POST-TAGGING MORTALITY	0	—	0	0	0	0.6	0	0	1.0	0.2	1.1	0.6	—	0.9
NUMBER LOST TAGS FROM 24H HOLD	0	—	0	0	0	0	0	0	0	0	0	0	—	0
PERCENT LOST TAGS FROM 24H HOLD	0	—	0	0	0	0	0	0	0	0	0	0	—	0
MAXIMUM LENGTH OF POST-TAGGING MORTALITY	—	—	71	—	—	71	73	63	63	73	80	71	72	80
MINIMUM LENGTH OF POST-TAGGING MORTALITY	—	—	53	—	—	71	60	52	56	52	67	71	61	61
AVERAGE LENGTH OF POST-TAGGING MORTALITY	—	—	60	—	—	71	68	58	60	62	72	71	67	70
MAXIMUM WEIGHT OF POST-TAGGING MORTALITY	—	—	4.8	—	—	—	4.8	—	2.9	4.8	—	—	4.4	4.4
MINIMUM WEIGHT OF POST-TAGGING MORTALITY	—	—	2.2	—	—	—	2.3	—	2.2	2.2	—	—	2.4	2.4
AVERAGE WEIGHT OF POST-TAGGING MORTALITY	—	—	3.0	—	—	—	3.6	—	2.6	3.1	—	—	3.4	3.4

Appendix Table 19.0. --Detections of PIT tags by date at three dams for wild spring chinook salmon from Bear Valley Creek, 1991.

Tagging Site: Bear Valley Creek Release Date: 08/02/90 to 08/05/90
Release Site: Bear Valley Creek Number Released: 352

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/18/91	1					
04/24/91	1					
04/25/91	1					
04/27/91		1				
04/28/91		1				
04/29/91		1				
05/01/91	1					
05/03/91	1					
05/04/91	1					
05/07/91	1					
05/08/91	1					
05/13/91	1					
05/14/91	1					
05/15/91	1					
05/16/91	1	1				
05/17/91	4					
05/18/91	3	2				
05/19/91	1					
05/20/91	2	1				
05/21/91	6	1				
05/22/91	1					
05/23/91	3	3	2			
05/24/91		2				
05/25/91	1	1				
05/26/91				1		
05/27/91	1	1		1		
05/28/91	1	1				
06/02/91		1				
06/03/91		1				
06/05/91	1					
06/06/91	1					
06/07/91	1					
06/09/91	1					
06/10/91		1				
06/11/91		1				
06/12/91	1	1				
06/14/91	1					
06/15/91	1					
06/22/91	1					
06/23/91	1	1				
Totals	44	22	2	2	0	0

Appendix Table 20.0. --Detections of PIT tags by date at three dams for wild spring chinook salmon from Big Creek, 1991.

Tagging Site: Big Creek
Release Site: Big Creek
Release Date: 08/22/90 to 08/23/90
Number Released: 724

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/26/91	1					
04/28/91		1				
04/29/91	1					
05/06/91	1					
05/09/91		1				
05/11/91	1					
05/12/91	1					
05/18/91	2					
05/21/91	4					
05/22/91	4					
05/23/91		1				
05/24/91		2				
05/25/91	1	1				
05/27/91	1					
05/28/91		1				
05/30/91		1				
05/31/91	1					
06/01/91	1	1				
06/02/91	1	1				
06/03/91	3					
06/04/91	3					
06/05/91		1				
06/06/91	2					
06/07/91	1					
06/08/91	1	1				
06/09/91	2	2				
06/10/91	2	2		1		
06/11/91	3					
06/12/91	1					
06/13/91	1	1				
06/14/91	5	1				
06/15/91	2					
06/16/91	3	1				
06/17/91	1					
06/18/91	1	2				
06/19/91	2					
06/20/91	3					
06/21/91	1					
06/22/91	1					
06/24/91	2					
06/25/91		2				
06/26/91	3					
06/27/91	1					
06/28/91				1		
06/29/91	2	1				
07/01/91	1	1				
07/02/91		1				
Totals	67	26	0	2	0	0

Appendix Table 21.0. --Detections of PIT tags by date at three dams for wild spring chinook salmon from Capehorn Creek, 1991.

Tagging Site: Capehorn Creek
Release Site: Capehorn Creek
Release Date: 08/11/90 to 08/12/90
Number Released: 164

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/19/91	1					
04/22/91	1					
04/24/91	1					
04/26/91	1					
04/27/91	1					
05/06/91	1					
05/07/91	1					
05/08/91	1					
05/11/91		1				
05/12/91	1					
05/13/91	2					
05/15/91	1					
05/16/91	1					
05/17/91	3					
05/19/91	1					
05/20/91	1					
05/21/91	2					
05/22/91	1	1				
05/23/91		2	1			
05/24/91	1					
05/25/91		3		1		
05/28/91	1					
05/30/91	1					
06/02/91		1				
06/06/91	1					
Totals	25	8	1	1	0	0

Appendix Table 22.0. --Detections of PIT tags by date at three dams for wild spring chinook salmon from E F Salmon River, 1991.

Tagging Site: E F Salmon River
Release Site: E F Salmon River
Release Date: 08/15/90 to 08/16/90
Number Released: 532

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/16/91	1					
04/22/91	1					
04/23/91	2					
04/24/91	1					
04/25/91	1					
04/27/91		1				
04/29/91		2				
04/30/91		2				
05/06/91				1		
05/07/91	1			1		
05/08/91	1	1		1		
05/09/91	1					
05/11/91	2	1				
05/12/91		1				
05/13/91	1			1		
05/15/91	1					
05/16/91	1			1		
05/17/91		1				
05/19/91	1					
05/20/91	1					
05/21/91		1				
05/22/91		2				
05/23/91		1				
05/26/91	1					
06/03/91		1				
06/04/91				1		
06/20/91	1					
Totals	18	14	0	6	0	0

Appendix Table 23.0. --Detections of PIT tags by date at three dams for wild spring chinook salmon from Elk Creek, 1991.

Tagging Site: Elk Creek
Release Site: Elk Creek
Release Date: 08/05/90 to 08/07/90
Number Released: 247

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/25/91	3					
04/30/91		1				
05/03/91	1					
05/12/91	1	1				
05/13/91	1					
05/14/91	1	1				
05/15/91		1				
05/16/91	1					
05/17/91	1					
05/18/91	3					
05/20/91	4	1				
05/21/91	5	1				
05/22/91	1	2				
05/23/91		2				
05/24/91	1	1				
05/25/91		2				
05/26/91		1				
06/01/91	1					
06/02/91	1					
06/07/91	1					
06/09/91	1					
06/12/91	1			1		
06/16/91	1					
06/18/91				1		
06/19/91	1					
06/24/91	2					
Totals	32	14	0	2	0	0

Appendix Table 24.0. --Detections of PIT tags by date at three dams for wild spring chinook salmon from Marsh Creek, 1991.

Tagging Site: Marsh Creek
Release Site: Marsh Creek
Release Date: 08/11/90 to 08/13/90
Number Released: 861

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/17/91	1					
04/19/91	1					
04/20/91	1					
04/23/91	1					
04/26/91	2					
04/27/91	1					
04/28/91	1					
04/30/91		2				
05/01/91		1				
05/02/91		1				
05/04/91	1					
05/05/91	1					
05/06/91				1		
05/07/91	1	1				
05/09/91	2					
05/10/91	3					
05/11/91	1	2				
05/12/91	1	2				
05/14/91	1			1		
05/15/91				1		
05/16/91	2	3				
05/17/91	2					
05/18/91	2					
05/19/91	4					
05/20/91	8					
05/21/91	5	1		1		
05/22/91	1	3	1			
05/23/91		5	1			
05/24/91	5					
05/26/91	1	1		1		
05/27/91		1		1		
05/28/91		1				
05/29/91	1					
05/31/91	1					
06/01/91		1				
06/03/91	1					
06/04/91	1					
06/06/91		1				
06/09/91	2					
06/12/91				1		
06/13/91	2					
06/14/91		1				
06/15/91	1					
06/18/91	1					
Totals	59	27	2	7	0	0

Appendix Table 25.0. --Detections of PIT tags by date at three dams for wild summer chinook salmon from Secesh River, 1991.

Tagging Site: Secesh River
Release Site: Secesh River
Release Date: 08/26/90 to 08/27/90
Number Released: 1016

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/13/91	1					
04/18/91	3					
04/19/91	1					
04/20/91	5					
04/21/91	3					
04/22/91	5					
04/23/91	4					
04/24/91	6					
04/25/91	3					
04/26/91	4					
04/27/91	2					
04/28/91	1	1				
04/29/91	1	1				
04/30/91	1	2				
05/01/91	1					
05/02/91	3	2				
05/04/91	1					
05/05/91	1					
05/08/91	1	1				
05/11/91	1					
05/12/91				1		
05/13/91		1				
05/15/91	2	1		1		
05/16/91	2					
05/17/91	1					
05/20/91	3	1				
05/21/91	1	1				
05/22/91		1				
05/23/91		2				
05/24/91	1					
05/27/91	1					
05/28/91				1		
06/01/91	1					
06/07/91	1					
06/09/91				1		
06/10/91		1				
06/11/91	2					
06/13/91		1		1		
06/14/91	1	1				
06/15/91		1				
06/17/91	1					
06/20/91	1					
06/25/91	1					
06/26/91		1				
06/27/91	2					
06/28/91		1				
07/01/91		1				
07/18/91	1					
07/20/91	1					
Totals	71	21	0	5	0	0

Appendix Table 26.0. —Detections of PIT tags by date at three dams for wild summer chinook salmon from S F Salmon River, 1991.

Tagging Site: S F Salmon River
Release Site: S F Salmon River
Release Date: 08/19/90 to 08/20/90
Number Released: 986

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/17/91	1					
04/19/91	2	1				
04/20/91	9					
04/21/91	1					
04/22/91	3					
04/23/91	1					
04/24/91	5					
04/25/91	1	1				
04/26/91	1					
04/27/91	2	1				
04/28/91	1	1				
04/29/91	2	1				
04/30/91	1	1				
05/01/91		2				
05/02/91		1				
05/03/91	1					
05/04/91	3					
05/07/91	1					
05/08/91	1	1		1		
05/09/91	3	1				
05/10/91				2		
05/11/91		2				
05/12/91	2					
05/13/91	2	2				
05/14/91	1			1		
05/15/91	2					
05/16/91	3	1				
05/17/91	1					
05/18/91	2					
05/19/91	2					
05/20/91	7	1				
05/21/91	6					
05/22/91	8	3				
05/23/91		5	1			
05/24/91	1	1				
05/25/91	1	2				
05/26/91	1					
05/27/91				1		
05/30/91	1			1		
05/31/91	2					
06/01/91	1					
06/06/91	2	2				
06/07/91	2					
06/08/91	2					
06/09/91		1				
06/10/91	1					
06/11/91		2				
06/13/91	3					
06/14/91	1					

Appendix Table 26.0. --(cont.)

Tagging Site: S F Salmon River
Release Site: S F Salmon River

Release Date: 08/19/90 to 08/20/90
Number Released: 986

Detection Date	Lower Granite First Detection	Little Goose		McNary		
		First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
06/15/91	2	2				
06/18/91		2		1		
06/20/91	1					
06/26/91	1					
07/13/91	1					
Totals	98	37	1	7	0	0

Appendix Table 27.0. --Detections of PIT tags by date at three dams for wild spring chinook salmon from Valley Creek, 1991.

Tagging Site: Valley Creek
Release Site: Valley Creek
Release Date: 08/08/90 to 08/10/90
Number Released: 1023

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/21/91	1					
04/22/91	1					
04/27/91	1					
05/01/91		1				
05/10/91		1				
05/08/91	1					
05/11/91	3					
05/12/91	1					
05/13/91				1		
05/14/91	1			1		
05/15/91	1			1		
05/16/91	1					
05/17/91	2					
05/18/91	2	1				
05/19/91		1				
05/20/91	6					
05/21/91	1	1		1		
05/23/91		1				
05/24/91	1			1		
05/25/91	1	1				
05/26/91		1				
05/30/91		1				
06/04/91		1				
06/05/91	1	1				
06/07/91	1					
06/08/91	1					
06/09/91	1					
06/11/91	1	1				
06/13/91	1	1				
06/14/91	1	2				
06/16/91	2	1				
06/18/91	2					
06/19/91	1					
06/20/91	1					
06/22/91	1	1				
06/27/91	1	1		1		
07/04/91				1		
07/05/91	1					
07/06/91				1		
07/13/91	1					
Totals	41	18	0	8	0	0

Appendix Table 28.0. --Detections of PIT tags by date at three dams for wild spring chinook salmon from Catherine Creek, 1991.

Tagging Site: Catherine Creek
Release Site: Catherine Creek
Release Date: 09/20/90 to 09/21/90
Number Released: 1012

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/17/91	1					
04/19/91	1					
04/25/91		1				
04/26/91	2					
04/27/91	1	1				
04/29/91	1					
04/30/91	1					
05/01/91	1	2				
05/02/91	1	1				
05/03/91	4	1				
05/04/91	2					
05/05/91	2	1				
05/06/91	4					
05/07/91	2					
05/08/91	2	2				
05/09/91	2	1				
05/10/91	1					
05/11/91	1	1		1		
05/12/91	6					
05/13/91	2					
05/14/91	2			1		
05/15/91	1	1				
05/16/91	3	1		2		
05/17/91	3	2				
05/18/91	3	2				
05/19/91	2	1		1		
05/20/91	6	4		1		
05/22/91		1				
05/23/91		4				
05/25/91	1					
05/26/91	2					
05/28/91	1					
05/29/91	1					
05/30/91	1	1				
06/01/91	1	1				
06/02/91		3				
06/03/91		2				
06/05/91	2					
06/07/91	2	1				
06/08/91	2					
06/09/91		4				
06/10/91	2					
06/12/91	2					
06/14/91	1	2				
06/15/91	1			1		
06/23/91	1					
Totals	77	41	0	7	0	0

Appendix Table 29.0. --Detections of PIT tags by date at three dams for wild summer chinook salmon from Imnaha River, 1991.

Tagging Site: Imnaha River
Release Site: Imnaha River

Release Date: 09/25/90
Number Released: 327

Detection Date	Lower Granite First Detection	Little Goose		McNary		
		First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/14/91	1					
04/20/91	1					
04/23/91	1					
04/24/91	1					
04/25/91	2					
04/26/91	1					
04/27/91	1	1				
04/29/91		1				
04/30/91		1				
05/01/91	1					
05/03/91		1				
05/04/91	1					
05/05/91	1					
05/06/91		1		1		
05/07/91	1					
05/08/91	3					
05/09/91	1					
05/12/91		1				
05/13/91	1					
05/15/91	1	1				
05/17/91				1		
05/18/91		1		2		
05/22/91				1		
05/25/91		1				
Totals	18	9	0	5	0	0

Appendix Table 30.0. --Detections of PIT tags by date at three dams for wild spring chinook salmon from Lostine River, 1991.

Tagging Site: Lostine River
Release Site: Lostine River
Release Date: 09/18/90 to 09/19/90
Number Released: 1006

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/20/91	1					
04/22/91	2					
04/24/91	2					
04/25/91	1					
04/28/91	2					
04/29/91	1					
04/30/91		1				
05/01/91	2	1				
05/02/91	1	1				
05/03/91		1				
05/04/91	1					
05/05/91	2					
05/06/91	1					
05/07/91	2			1		
05/08/91	2			1		
05/09/91	4	1				
05/10/91	3	2		1		
05/11/91	4	1				
05/12/91	6	2				
05/13/91	7	1				
05/14/91	3	2				
05/15/91	4	1				
05/16/91	4			2		
05/17/91	5	2		2		
05/18/91	3	3				
05/19/91	2	3				
05/20/91	4	1		1		
05/21/91	5	3		3		
05/22/91	1	2				
05/23/91	3	10				
05/24/91	1					
05/26/91	2			1		
05/27/91				3		
05/28/91	1					
05/30/91	1					
05/31/91		1				
06/01/91	1			1		
06/04/91	2	1				
06/06/91		1				
06/10/91	1	2				
06/11/91	1			1		
06/13/91		1				
06/14/91		1				
06/15/91		1				
06/16/91				1		
06/17/91		1				
06/18/91	1					
06/21/91				1		
07/09/91	1					
Totals	90	47	0	19	0	0

Appendix Table 31.0. --Detections of PIT tags by date at three dams for hatchery spring chinook salmon from Dworshak Hatchery (low BKD group), 1991

Tagging Site: Dworshak Hatchery Release Date: 04/03/91
Release Site: Clearwater River Number Released: 2250

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/10/91	1					
04/11/91	3					
04/12/91	1					
04/13/91	2					
04/14/91	10					
04/15/91	5					
04/16/91	3					
04/17/91	5					
04/18/91	6					
04/19/91	24					
04/20/91	19					
04/21/91	16					
04/22/91	16	1				
04/23/91	29					
04/24/91	40	1				
04/25/91	34	1				
04/26/91	28	2				
04/27/91	27	4				
04/28/91	31	2				
04/29/91	31	3				
04/30/91	16	10				
05/01/91	10	18				
05/02/91	12	10				
05/03/91	14	13				
05/04/91	13	13				
05/05/91	18	8				
05/06/91	10	6		3		
05/07/91	24	13		1		
05/08/91	20	7				
05/09/91	16	12		1		
05/10/91	12	7		3		
05/11/91	18	8				
05/12/91	8	6		1		
05/13/91	6	5		4		
05/14/91	2	2		5		
05/15/91	3	7		10		
05/16/91	2	5		7		
05/17/91	2	6		3		
05/18/91	2	5		3		
05/19/91	1	1		5		
05/20/91	5	1				
05/21/91	3	2		3		
05/22/91		5				
05/23/91	1	6	1	2		
05/24/91				3		
05/26/91				3		
05/27/91					1	
Totals	549	190	1	57	1	0

Appendix Table 32.0. --Detections of PIT tags by date at three dams for hatchery spring chinook salmon from Dworshak Hatchery (high BKD group), 1991

Tagging Site: Dworshak Hatchery
Release Site: Clearwater River
Release Date: 04/03/91
Number Released: 4491

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/09/91	2					
04/10/91	2					
04/11/91	3					
04/12/91	6					
04/13/91	8					
04/14/91	17					
04/15/91	29					
04/16/91	27					
04/17/91	20					
04/18/91	47					
04/19/91	61					
04/20/91	77					
04/21/91	51					
04/22/91	64	1				
04/23/91	84	2				
04/24/91	102	2				
04/25/91	74	2				
04/26/91	54	1				
04/27/91	43	6				
04/28/91	59	4				
04/29/91	37	15				
04/30/91	23	10				
05/01/91	11	7				
05/02/91	18	12				
05/03/91	12	11				
05/04/91	12	4				
05/05/91	14	5		1		
05/06/91	6	2		2		
05/07/91	25	4				
05/08/91	10	3				
05/09/91	20	8		3		
05/10/91	13	8		2		
05/11/91	22	6				
05/12/91	5	6				
05/13/91	6	4				
05/14/91	3	2		1		
05/15/91	1	5		3		
05/16/91	1	5		4		
05/17/91	2	2		1		
05/18/91	1	2		6		
05/19/91	4	1		2		
05/20/91	4					
05/21/91	3	2		1		
05/22/91		1				
05/23/91			1	1		
05/24/91				3		
05/26/91				2	1	
Totals	1083	143	1	32	1	0

Appendix Table 33.0. --Detections of PIT tags by date at three dams for hatchery spring chinook salmon from Sawtooth Hatchery (low BKD group), 1991

Tagging Site: Sawtooth Hatchery
Release Site: Salmon River
Release Date: 03/13/91
Number Released: 3521

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/14/91	2					
04/15/91	5					
04/16/91	2					
04/17/91	4					
04/18/91	2					
04/19/91	5					
04/20/91	1					
04/21/91	1					
04/22/91	4					
04/23/91	4					
04/24/91	12					
04/25/91	10					
04/26/91	3					
04/27/91	14	2				
04/28/91	13	4				
04/29/91	6	3		2		
04/30/91	8	5				
05/01/91	4	6				
05/02/91	1	2				
05/03/91	4	1		2		
05/04/91	7	2		2		
05/05/91	8	1				
05/06/91	3	1		3		
05/07/91	6	1				
05/08/91	5					
05/09/91	8	3				
05/10/91	4					
05/11/91	4	1				
05/12/91	1			1		
05/13/91	5	3		1		
05/14/91				1		
05/15/91		1		1		
05/16/91	2					
05/17/91	1	1		2		
05/18/91	2			1		
05/19/91	2	1		2		
05/20/91	3	2		1		
05/21/91	2			3		
05/22/91		2				
05/23/91		1				
05/25/91				1		
05/27/91		1				
05/29/91		1				
05/30/91	1					
06/07/91	1					
06/08/91		1				
06/10/91		1				
06/12/91	1					
Totals	171	47	0	23	0	0

Appendix Table 34.0. ---Detections of PIT tags by date at three dams for hatchery spring chinook salmon from Sawtooth Hatchery (high BKD group), 1991

Tagging Site: Sawtooth Hatchery
Release Site: Salmon River
Release Date: 03/13/91
Number Released: 3564

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/20/91	2					
04/21/91	3					
04/22/91	2					
04/23/91	1					
04/24/91	12					
04/25/91	1					
04/26/91	2					
04/27/91	9					
04/28/91	6					
04/29/91	8	1				
04/30/91	1	5				
05/01/91		5				
05/02/91	1	4				
05/03/91	6					
05/04/91	2	1		1		
05/05/91	5					
05/06/91	5	1				
05/07/91	7			3		
05/08/91	3	2				
05/09/91	3	1		2		
05/10/91	5	2				
05/11/91	10	2		1		
05/12/91	3	1		1		
05/13/91	4	3				
05/14/91	8	1		1		
05/15/91	1			3		
05/16/91	6	2		2		
05/17/91	2			1		
05/18/91	1			1		
05/19/91	3	1				
05/20/91	7					
05/21/91	4			2		
05/22/91				1		
05/23/91		4	1			
05/25/91		1				
05/26/91		1				
05/28/91		1				
05/29/91	1					
05/30/91	1					
06/01/91		1				
06/03/91		1				
06/04/91				1		
06/05/91	1	2				
Totals	136	43	1	20	0	0

Appendix Table 35.0. --Detections of PIT tags by date at three dams for hatchery summer chinook salmon from McCall Hatchery, 1991

Tagging Site: McCall Hatchery Release Date: 03/18/91
Release Site: South F Salmon River Number Released: 400

Detection Date	Lower Granite	Little Goose		McNary		
	First Detection	First Detect.	Prev. Detect. at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	Prev. Detect. at 2 Dams
04/26/91	1					
04/27/91	3					
04/29/91	1					
04/30/91	1					
05/03/91	2	1				
05/04/91	2					
05/05/91	3					
05/06/91	2					
05/07/91	4					
05/08/91	3			1		
05/09/91	5	2				
05/10/91	4	1				
05/11/91	5	1				
05/12/91	10					
05/13/91	2					
05/14/91	2	1				
05/15/91	1			2		
05/16/91	3	1				
05/17/91	2					
05/18/91	4					
05/19/91	8	1				
05/20/91	4	1		2		
05/21/91	4					
05/22/91	1	6				
05/23/91		7				
05/25/91	1	2		3		
05/26/91		1				
05/27/91		1		2		
05/28/91	1					
05/29/91	1	1				
05/30/91	4					
05/31/91	2					
06/01/91		1				
06/03/91	1					
06/04/91	1	1				
06/05/91	1					
06/06/91	1					
06/07/91	1	1				
06/08/91		1				
06/10/91	1					
06/12/91	1					
06/13/91	1					
06/15/91	1					
06/20/91	1					
06/22/91	1					
Totals	97	31	0	10	0	0

Appendix Table 36.0. --Physical parameters of hourly tests of the PIT-tag detection/diversion system test at Lower Granite Dam, 1991

Date	Time	Gate Cycle-times North	Gate Cycle-times South	Expanded Hourly Count	Species Composition % Steelhead
04/16/91	18:00:00	0.419	0.444	120.0	6.17
04/16/91	19:00:00	0.419	0.444	468.2	6.17
04/16/91	20:00:00	0.419	0.444	936.4	6.17
04/16/91	21:00:00	0.419	0.444	876.4	6.17
04/16/91	22:00:00	0.419	0.444	1,044.4	6.17
04/17/91	19:00:00	0.419	0.444	372.1	7.25
04/17/91	20:00:00	0.419	0.444	396.2	7.25
04/17/91	21:00:00	0.419	0.444	804.3	7.25
04/17/91	22:00:00	0.419	0.444	684.3	7.25
04/17/91	23:00:00	0.419	0.444	432.2	7.25
04/18/91	19:00:00	0.421	0.444	576.2	5.94
04/18/91	20:00:00	0.421	0.444	1,128.5	5.94
04/18/91	21:00:00	0.421	0.444	1,176.5	5.94
04/18/91	22:00:00	0.421	0.444	1,176.5	5.94
04/22/91	19:00:00	0.422	0.446	1,454.3	8.97
04/22/91	20:00:00	0.422	0.446	1,619.2	8.97
04/22/91	21:00:00	0.422	0.446	1,244.4	8.97
04/22/91	22:00:00	0.422	0.446	809.6	8.97
04/23/91	10:00:00	0.422	0.447	869.6	5.08
04/23/91	11:00:00	0.422	0.447	1,544.2	5.08
04/23/91	12:00:00	0.422	0.447	2,758.6	5.08
04/23/91	13:00:00	0.422	0.447	1,784.1	5.08
04/23/91	14:00:00	0.422	0.447	1,214.4	5.08
04/23/91	15:00:00	0.422	0.447	764.6	5.08
04/24/91	10:00:00	0.422	0.447	3,020.0	6.77
04/24/91	12:00:00	0.422	0.447	2,920.0	6.77
04/24/91	16:00:00	0.422	0.447	5,380.0	6.77
04/25/91	12:00:00	0.422	0.446	3,173.7	14.78
04/25/91	13:00:00	0.422	0.446	3,113.8	14.78
04/25/91	14:00:00	0.422	0.446	5,029.9	14.78
04/25/91	15:00:00	0.422	0.446	4,071.9	14.78
04/25/91	19:00:00	0.422	0.446	3,532.9	14.78
04/25/91	20:00:00	0.422	0.446	2,395.2	14.78
04/25/91	21:00:00	0.422	0.446	3,113.8	14.78
04/25/91	22:00:00	0.422	0.446	3,053.9	14.78
04/26/91	12:00:00	0.422	0.446	2,372.4	26.78
04/26/91	15:00:00	0.422	0.444	1,171.2	26.78
04/26/91	19:00:00	0.422	0.446	2,522.5	26.78
04/26/91	20:00:00	0.422	0.446	8,018.0	26.78
04/26/91	21:00:00	0.422	0.446	9,519.5	26.78
04/26/91	22:00:00	0.422	0.446	9,009.0	26.78
04/27/91	12:00:00	0.422	0.446	4,970.1	28.00
04/27/91	13:00:00	0.422	0.446	4,910.2	28.00
04/27/91	14:00:00	0.422	0.446	3,473.1	28.00
04/27/91	15:00:00	0.422	0.446	2,814.4	28.00
04/27/91	19:00:00	0.422	0.446	3,173.7	28.00
04/27/91	20:00:00	0.422	0.446	10,718.6	28.00
04/27/91	21:00:00	0.422	0.446	6,766.5	28.00
04/27/91	22:00:00	0.422	0.446	7,964.1	28.00
04/28/91	12:00:00	0.463	0.452	7,724.6	36.27
04/28/91	13:00:00	0.463	0.452	4,730.5	36.27
04/28/91	14:00:00	0.463	0.452	6,706.6	36.27
04/28/91	15:00:00	0.463	0.452	6,287.4	36.27
04/28/91	19:00:00	0.463	0.452	9,461.1	36.27
04/28/91	20:00:00	0.463	0.452	18,143.7	36.27
04/28/91	21:00:00	0.463	0.452	10,718.6	36.27
04/28/91	22:00:00	0.463	0.452	13,293.4	36.27
04/29/91	12:00:00	0.462	0.447	6,706.6	43.37
04/29/91	13:00:00	0.462	0.447	5,449.1	43.37
04/29/91	14:00:00	0.462	0.447	6,167.7	43.37
04/29/91	21:00:00	0.462	0.447	16,946.1	43.37

Appendix Table 36.0. --(continued)

Date	Time	Gate Cycle-times North	Gate Cycle-times South	Expanded Hourly Count	Species Composition % Steelhead
04/29/91	22:00:00	0.462	0.447	11,556.9	43.37
04/30/91	5:00:00	0.460	0.444	5,329.3	68.23
04/30/91	6:00:00	0.460	0.444	10,299.4	68.23
04/30/91	7:00:00	0.460	0.444	7,544.9	68.23
04/30/91	8:00:00	0.460	0.444	5,029.9	68.23
04/30/91	21:00:00	0.463	0.444	7,245.5	68.23
04/30/91	22:00:00	0.463	0.444	5,868.3	68.23
05/01/91	5:00:00	0.461	0.444	5,509.0	60.40
05/01/91	6:00:00	0.461	0.444	4,012.0	60.40
05/01/91	7:00:00	0.461	0.444	3,053.9	60.40
05/01/91	8:00:00	0.461	0.444	3,652.7	60.40
05/01/91	19:00:00	0.462	0.443	4,431.1	60.40
05/01/91	20:00:00	0.462	0.443	4,491.0	60.40
05/01/91	21:00:00	0.461	0.444	5,628.7	60.40
05/01/91	22:00:00	0.462	0.443	8,503.0	60.40
05/02/91	12:00:00	0.463	0.446	6,047.9	52.97
05/02/91	13:00:00	0.463	0.446	5,209.6	52.97
05/02/91	14:00:00	0.463	0.446	4,431.1	52.97
05/02/91	15:00:00	0.463	0.446	3,353.3	52.97
05/02/91	19:00:00	0.463	0.446	3,053.9	52.97
05/02/91	20:00:00	0.463	0.446	11,437.1	52.97
05/02/91	21:00:00	0.463	0.446	8,203.6	52.97
05/02/91	22:00:00	0.463	0.446	10,658.7	52.97
05/03/91	12:00:00	0.462	0.444	5,209.6	72.11
05/03/91	13:00:00	0.462	0.444	4,371.3	72.11
05/03/91	14:00:00	0.462	0.444	4,550.9	72.11
05/03/91	15:00:00	0.462	0.444	3,592.8	72.11
05/03/91	19:00:00	0.462	0.444	5,988.0	72.11
05/03/91	20:00:00	0.462	0.444	12,035.9	72.11
05/03/91	21:00:00	0.462	0.444	10,179.6	72.11
05/03/91	22:00:00	0.462	0.444	11,437.1	72.11
05/04/91	12:00:00	0.463	0.445	7,365.3	71.69
05/04/91	13:00:00	0.463	0.445	4,670.7	71.69
05/04/91	14:00:00	0.463	0.445	5,149.7	71.69
05/04/91	15:00:00	0.463	0.445	2,814.4	71.69
05/04/91	19:00:00	0.463	0.445	5,808.4	71.69
05/04/91	20:00:00	0.463	0.445	13,952.1	71.69
05/04/91	21:00:00	0.463	0.445	13,233.5	71.69
05/04/91	22:00:00	0.463	0.445	13,532.9	71.69
05/05/91	5:00:00	0.462	0.444	19,880.2	68.09
05/05/91	6:00:00	0.462	0.444	7,664.7	68.09
05/05/91	7:00:00	0.462	0.444	8,982.0	68.09
05/05/91	8:00:00	0.462	0.444	7,006.0	68.09
05/05/91	19:00:00	0.463	0.446	10,658.7	68.09
05/05/91	20:00:00	0.463	0.446	17,604.8	68.09
05/05/91	21:00:00	0.463	0.446	14,012.0	68.09
05/05/91	22:00:00	0.463	0.446	9,760.5	68.09
05/06/91	5:00:00	0.463	0.445	6,706.6	68.86
05/06/91	6:00:00	0.463	0.445	3,772.5	68.86
05/06/91	7:00:00	0.463	0.445	3,473.1	68.86
05/06/91	8:00:00	0.463	0.445	3,413.2	68.86
05/06/91	19:00:00	0.463	0.445	6,766.5	68.86
05/06/91	20:00:00	0.463	0.445	12,934.1	68.86
05/06/91	21:00:00	0.463	0.445	10,598.8	68.86
05/06/91	22:00:00	0.463	0.445	9,880.2	68.86
05/07/91	12:00:00	0.467	0.447	11,137.7	57.87
05/07/91	13:00:00	0.467	0.447	15,269.5	57.87
05/07/91	14:00:00	0.467	0.447	6,407.2	57.87
05/07/91	15:00:00	0.467	0.447	4,012.0	57.87
05/07/91	19:00:00	0.467	0.447	7,185.6	57.87
05/07/91	20:00:00	0.467	0.447	19,281.4	57.87
05/07/91	21:00:00	0.467	0.447	21,616.8	57.87

Appendix Table 36.0. --(continued)

Date	Time	Gate Cycle-times North	Gate Cycle-times South	Expanded Hourly Count	Species Composition % Steelhead
05/07/91	22:00:00	0.467	0.447	18,742.5	57.87
05/08/91	12:00:00	0.467	0.446	7,485.0	63.63
05/08/91	13:00:00	0.467	0.446	11,916.2	63.63
05/08/91	14:00:00	0.467	0.446	9,940.1	63.63
05/08/91	15:00:00	0.467	0.446	4,371.3	63.63
05/08/91	19:00:00	0.467	0.446	8,443.1	63.63
05/08/91	20:00:00	0.467	0.446	16,886.2	63.63
05/08/91	21:00:00	0.467	0.446	14,311.4	63.63
05/08/91	22:00:00	0.467	0.446	16,826.3	63.63
05/14/91	19:00:00	0.412	0.447	6,000.0	91.21
05/14/91	20:00:00	0.412	0.447	13,800.0	91.21
05/14/91	21:00:00	0.412	0.447	10,100.0	91.21
05/14/91	22:00:00	0.412	0.447	10,100.0	91.21
05/20/91	19:00:00	0.413	0.447	39,300.0	90.11
05/20/91	20:00:00	0.413	0.447	36,000.0	90.11
05/20/91	21:00:00	0.413	0.447	29,300.0	90.11
05/20/91	22:00:00	0.413	0.447	26,400.0	90.11
05/21/91	5:00:00	0.413	0.461	24,800.0	91.47
05/21/91	6:00:00	0.413	0.461	33,800.0	91.47
05/21/91	7:00:00	0.413	0.461	32,100.0	91.47
05/21/91	8:00:00	0.413	0.461	20,500.0	91.47
05/21/91	9:00:00	0.413	0.461	17,800.0	91.47
05/21/91	10:00:00	0.413	0.461	34,800.0	91.47
05/21/91	11:00:00	0.413	0.461	21,700.0	91.47
05/21/91	19:00:00	0.413	0.461	10,800.0	91.47
05/21/91	20:00:00	0.413	0.461	16,100.0	91.47
05/21/91	21:00:00	0.413	0.461	16,500.0	91.47

Appendix Table 37.0. --Numbers of PIT-tagged and untagged fish diverted in hourly tests of the PIT-tag detection/diversion system at Lower Granite Dam, 1991.

Date	Time	PIT-tagged fish diverted			Untagged fish diverted			Total Cycles	Untagged fish per side-gate cycle
		Chinook	Steelhead	Total	Chinook	Steelhead	Total		
04/16/91	18:00:00	0	0	0	0	0	0	1	0.00
04/16/91	19:00:00	3	0	3	0	0	0	2	0.00
04/16/91	20:00:00	4	1	5	0	0	0	5	0.00
04/16/91	21:00:00	10	0	10	2	0	2	12	0.17
04/16/91	22:00:00	3	1	4	0	0	0	4	0.00
04/17/91	19:00:00	2	0	2	0	0	0	2	0.00
04/17/91	20:00:00	5	0	5	0	0	0	5	0.00
04/17/91	21:00:00	7	0	7	0	0	0	7	0.00
04/17/91	22:00:00	1	0	1	0	0	0	1	0.00
04/17/91	23:00:00	1	0	1	0	0	0	1	0.00
04/18/91	19:00:00	2	0	2	0	0	0	2	0.00
04/18/91	20:00:00	12	0	12	1	0	2	13	0.15
04/18/91	21:00:00	11	0	11	1	0	1	11	0.09
04/18/91	22:00:00	6	0	6	0	0	0	7	0.00
04/22/91	19:00:00	12	0	12	1	0	1	13	0.08
04/22/91	20:00:00	13	1	14	2	1	3	15	0.20
04/22/91	21:00:00	10	0	10	1	1	2	11	0.18
04/22/91	22:00:00	6	0	6	0	1	1	6	0.17
04/23/91	10:00:00	2	0	2	0	0	0	2	0.00
04/23/91	11:00:00	3	0	3	0	0	0	3	0.00
04/23/91	12:00:00	10	0	10	7	0	7	12	0.58
04/23/91	13:00:00	5	1	6	5	0	5	9	0.56
04/23/91	14:00:00	2	0	2	0	0	0	3	0.00
04/23/91	15:00:00	4	0	4	1	0	1	5	0.20
04/24/91	10:00:00	17	1	18	11	1	12	20	0.60
04/24/91	12:00:00	7	3	10	5	0	5	12	0.42
04/24/91	16:00:00	11	1	12	18	1	19	19	1.00
04/25/91	12:00:00	7	0	7	3	0	3	7	0.43
04/25/91	13:00:00	10	0	10	8	0	8	15	0.53
04/25/91	14:00:00	11	0	11	5	1	6	15	0.40
04/25/91	15:00:00	8	0	8	16	12	28	14	2.00
04/25/91	19:00:00	7	1	8	4	0	4	10	0.40
04/25/91	20:00:00	14	1	15	3	1	4	14	0.29
04/25/91	21:00:00	9	1	10	3	2	5	12	0.42
04/25/91	22:00:00	9	5	14	16	23	39	17	2.29
04/26/91	12:00:00	6	1	7	4	5	9	12	0.75
04/26/91	15:00:00	4	1	5	4	1	5	9	0.56
04/26/91	19:00:00	6	1	7	4	1	5	9	0.56
04/26/91	20:00:00	22	5	27	15	8	23	27	0.85
04/26/91	21:00:00	20	2	22	13	2	15	24	0.63
04/26/91	22:00:00	29	4	33	38	5	43	35	1.23
04/27/91	12:00:00	6	3	9	3	3	6	10	0.60
04/27/91	13:00:00	2	3	5	4	6	10	9	1.11
04/27/91	14:00:00	10	2	12	6	2	8	14	0.57
04/27/91	15:00:00	7	2	9	3	1	4	13	0.31
04/27/91	19:00:00	8	5	13	6	5	11	16	0.69
04/27/91	20:00:00	19	6	25	21	19	40	25	1.60
04/27/91	21:00:00	16	5	21	25	21	46	22	2.09
04/27/91	22:00:00	22	3	25	37	5	42	30	1.40
04/28/91	12:00:00	12	3	15	16	2	18	19	0.95
04/28/91	13:00:00	7	2	9	4	5	9	13	0.69
04/28/91	14:00:00	10	5	15	8	10	18	21	0.86
04/28/91	15:00:00	4	1	5	2	0	2	6	0.33
04/28/91	19:00:00	19	4	23	27	13	40	35	1.14
04/28/91	20:00:00	26	11	37	57	43	100	41	2.44
04/28/91	21:00:00	17	5	22	14	4	18	24	0.75
04/28/91	22:00:00	28	6	34	25	8	33	38	0.87
04/29/91	12:00:00	6	3	9	7	4	11	10	1.10
04/29/91	13:00:00	7	2	9	3	2	5	15	0.33
04/29/91	14:00:00	5	2	7	3	6	9	13	0.69
04/29/91	21:00:00	29	10	39	94	57	151	48	3.15
04/29/91	22:00:00	26	2	28	30	8	38	31	1.23
04/30/91	5:00:00	11	1	12	1	5	6	17	0.35
04/30/91	6:00:00	10	4	14	15	9	24	20	1.20
04/30/91	7:00:00	9	6	15	6	17	23	17	1.35
04/30/91	8:00:00	4	3	7	1	5	6	7	0.86
04/30/91	21:00:00	10	2	12	5	16	21	20	1.05
04/30/91	22:00:00	4	1	5	2	2	4	12	0.33
05/01/91	5:00:00	2	3	5	3	3	6	7	0.86
05/01/91	6:00:00	5	4	9	1	4	5	13	0.38
05/01/91	7:00:00	1	5	6	0	16	16	7	2.29
05/01/91	8:00:00	1	2	3	1	7	8	13	0.62
05/01/91	19:00:00	4	3	7	3	2	5	10	0.50
05/01/91	20:00:00	6	5	11	0	5	5	12	0.42
05/01/91	21:00:00	7	7	14	4	5	9	21	0.43
05/01/91	22:00:00	11	7	18	5	8	13	21	0.62
05/02/91	12:00:00	12	1	13	8	14	22	15	1.47
05/02/91	13:00:00	4	0	4	0	3	3	9	0.33
05/02/91	14:00:00	4	1	5	1	2	3	6	0.50

Appendix Table 37.0. --(continued)

Date	Time	PIT-tagged fish diverted Chinook	Steelhead	Total	Untagged fish diverted Chinook	Steelhead	Total	Total Cycles	Untagged fish per side-gate cycle
05/02/91	15:00:00	6	0	6	2	0	2	10	0.20
05/02/91	19:00:00	5	3	8	2	4	6	9	0.67
05/02/91	20:00:00	6	11	17	18	31	49	19	2.58
05/02/91	21:00:00	13	4	17	13	10	23	18	1.28
05/02/91	22:00:00	12	5	17	11	10	21	22	0.95
05/03/91	12:00:00	5	3	8	2	14	16	12	1.33
05/03/91	13:00:00	1	2	3	1	2	3	6	0.50
05/03/91	14:00:00	4	3	7	1	4	5	8	0.63
05/03/91	15:00:00	1	3	4	1	0	1	6	0.17
05/03/91	19:00:00	8	3	11	2	10	12	15	0.80
05/03/91	20:00:00	18	10	28	22	27	49	33	1.48
05/03/91	21:00:00	15	8	23	21	15	36	31	1.16
05/03/91	22:00:00	20	7	27	21	40	61	30	2.03
05/04/91	12:00:00	2	3	5	0	6	6	7	0.86
05/04/91	13:00:00	3	4	7	1	5	6	7	0.86
05/04/91	14:00:00	4	5	9	2	10	12	10	1.20
05/04/91	15:00:00	1	1	2	0	0	0	4	0.00
05/04/91	19:00:00	5	3	8	3	19	22	10	2.20
05/04/91	20:00:00	13	5	18	8	20	28	23	1.22
05/04/91	21:00:00	20	13	33	18	28	46	38	1.21
05/04/91	22:00:00	19	13	32	13	32	45	35	1.29
05/05/91	5:00:00	7	13	20	9	40	49	29	1.69
05/05/91	6:00:00	1	14	15	3	60	63	20	3.15
05/05/91	7:00:00	6	11	17	1	12	13	19	0.68
05/05/91	8:00:00	8	9	17	1	21	22	19	1.16
05/05/91	19:00:00	5	6	11	4	13	17	17	1.00
05/05/91	20:00:00	30	14	44	53	108	161	58	2.78
05/05/91	21:00:00	10	10	20	11	28	39	23	1.70
05/05/91	22:00:00	12	18	30	8	28	36	33	1.09
05/06/91	5:00:00	7	6	13	1	4	5	14	0.36
05/06/91	6:00:00	3	2	5	1	4	5	6	0.83
05/06/91	7:00:00	2	2	4	0	4	4	5	0.80
05/06/91	8:00:00	2	3	5	1	3	4	5	0.80
05/06/91	19:00:00	3	2	5	2	9	11	8	1.38
05/06/91	20:00:00	7	10	17	2	18	20	22	0.91
05/06/91	21:00:00	11	10	21	12	18	30	25	1.20
05/06/91	22:00:00	9	9	18	7	15	22	20	1.10
05/07/91	12:00:00	16	11	27	22	21	43	32	1.34
05/07/91	13:00:00	11	3	14	4	11	15	20	0.75
05/07/91	14:00:00	7	4	11	4	8	12	15	0.80
05/07/91	15:00:00	3	2	5	2	2	4	8	0.50
05/07/91	19:00:00	12	7	19	6	5	11	21	0.52
05/07/91	20:00:00	39	19	58	58	194	252	61	4.13
05/07/91	21:00:00	38	11	49	37	38	75	51	1.47
05/07/91	22:00:00	22	15	37	25	26	51	42	1.21
05/08/91	12:00:00	1	11	12	4	18	22	15	1.47
05/08/91	13:00:00	4	10	14	5	20	25	18	1.39
05/08/91	14:00:00	5	2	7	1	5	6	10	0.60
05/08/91	15:00:00	1	4	5	0	6	6	5	1.20
05/08/91	19:00:00	14	6	20	11	14	25	25	1.00
05/08/91	20:00:00	22	15	37	29	64	93	43	2.16
05/08/91	21:00:00	24	10	34	29	22	51	40	1.28
05/08/91	22:00:00	24	5	29	20	18	38	35	1.09
05/14/91	19:00:00	2	8	10	1	8	9	13	0.69
05/14/91	20:00:00	4	36	40	10	203	213	48	4.44
05/14/91	21:00:00	3	22	25	4	14	18	36	0.50
05/14/91	22:00:00	6	17	23	3	18	21	25	0.84
05/20/91	19:00:00	18	40	58	22	148	170	66	2.58
05/20/91	20:00:00	23	43	66	46	175	221	72	3.07
05/20/91	21:00:00	23	30	53	17	94	111	53	2.09
05/20/91	22:00:00	18	37	55	21	156	177	64	2.77
05/21/91	5:00:00	8	14	22	3	65	68	24	2.83
05/21/91	6:00:00	6	29	35	14	115	129	41	3.15
05/21/91	7:00:00	5	38	43	3	99	102	45	2.27
05/21/91	8:00:00	7	29	36	10	59	69	39	1.77
05/21/91	9:00:00	4	15	19	5	32	37	21	1.76
05/21/91	10:00:00	3	31	34	6	164	170	41	4.15
05/21/91	11:00:00	2	38	40	5	61	66	41	1.61
05/21/91	19:00:00	9	17	26	1	36	37	34	1.09
05/21/91	20:00:00	10	12	22	4	33	37	23	1.61
05/21/91	21:00:00	6	13	19	4	13	17	19	0.89
Totals		1426	1023	2449	1356	3050	4407	2925	
Average per Test		9.51	6.82	16.3	9.04	20.3	29.4	19.5	1.02

Appendix Table 38.0. --Descaling and injury data for hourly tests of the PIT-tag detection/diversion system at Lower Granite Dam, 1991.

Date	Time	Chinook Not Des/Inj	Chinook Des/Inj	Steelhead Not Des/Inj	Steelhead Des/Inj	Total Des/Inj	Total Number of Fish	% Des/Inj
04/16/91	18:00:00	0	0	0	0	0	0	-NA-
04/16/91	19:00:00	3	0	0	0	0	3	0
04/16/91	20:00:00	4	0	1	0	0	5	0
04/16/91	21:00:00	10	2	0	0	2	12	17
04/16/91	22:00:00	3	0	1	0	0	4	0
04/17/91	19:00:00	2	0	0	0	0	2	0
04/17/91	20:00:00	5	0	0	0	0	5	0
04/17/91	21:00:00	7	0	0	0	0	7	0
04/17/91	22:00:00	1	0	0	0	0	1	0
04/17/91	23:00:00	1	0	0	0	0	1	0
04/18/91	19:00:00	1	1	0	0	1	2	50
04/18/91	20:00:00	13	0	0	0	0	13	0
04/18/91	21:00:00	12	0	0	0	0	12	0
04/18/91	22:00:00	6	0	0	0	0	6	0
04/22/91	19:00:00	13	0	0	0	0	13	0
04/22/91	20:00:00	15	0	2	0	0	17	0
04/22/91	21:00:00	11	0	1	0	0	12	0
04/22/91	22:00:00	6	0	1	0	0	7	0
04/23/91	10:00:00	2	0	0	0	0	2	0
04/23/91	11:00:00	3	0	0	0	0	3	0
04/23/91	12:00:00	17	0	0	0	0	17	0
04/23/91	13:00:00	10	0	1	0	0	11	0
04/23/91	14:00:00	2	0	0	0	0	2	0
04/23/91	15:00:00	5	0	0	0	0	5	0
04/24/91	10:00:00	27	1	2	0	1	30	3
04/24/91	12:00:00	12	0	3	0	0	15	0
04/24/91	16:00:00	29	0	2	0	0	31	0
04/25/91	12:00:00	10	0	0	0	0	10	0
04/25/91	13:00:00	18	0	0	0	0	18	0
04/25/91	14:00:00	15	1	1	0	1	17	6
04/25/91	15:00:00	24	0	12	0	0	36	0
04/25/91	19:00:00	11	0	1	0	0	12	0
04/25/91	20:00:00	16	1	2	0	1	19	5
04/25/91	21:00:00	12	0	3	0	0	15	0
04/25/91	22:00:00	24	1	28	0	1	53	2
04/26/91	12:00:00	10	0	6	0	0	16	0
04/26/91	15:00:00	8	0	2	0	0	10	0
04/26/91	19:00:00	9	1	2	0	1	12	8
04/26/91	20:00:00	35	2	13	0	2	50	4
04/26/91	21:00:00	32	1	4	0	1	37	3
04/26/91	22:00:00	64	3	9	0	3	76	4
04/27/91	12:00:00	9	0	6	0	0	15	0
04/27/91	13:00:00	6	0	9	0	0	15	0
04/27/91	14:00:00	16	0	4	0	0	20	0
04/27/91	15:00:00	9	1	3	0	1	13	8
04/27/91	19:00:00	14	0	10	0	0	24	0
04/27/91	20:00:00	40	0	25	0	0	65	0
04/27/91	21:00:00	41	0	26	0	0	67	0
04/27/91	22:00:00	58	1	8	0	1	67	1
04/28/91	12:00:00	26	2	5	0	2	33	6
04/28/91	13:00:00	11	0	5	2	2	18	11
04/28/91	14:00:00	16	2	14	1	3	33	9
04/28/91	15:00:00	6	0	1	0	0	7	0
04/28/91	19:00:00	45	1	17	0	1	63	2
04/28/91	20:00:00	79	4	51	3	7	137	5
04/28/91	21:00:00	30	1	9	0	1	40	3
04/28/91	22:00:00	52	1	13	1	2	67	3
04/29/91	12:00:00	13	0	7	0	0	20	0
04/29/91	13:00:00	10	0	4	0	0	14	0
04/29/91	14:00:00	8	0	8	0	0	16	0
04/29/91	21:00:00	118	5	66	1	6	190	3
04/29/91	22:00:00	54	2	9	1	3	66	5
04/30/91	5:00:00	11	1	6	0	1	18	6
04/30/91	6:00:00	24	1	13	0	1	38	3
04/30/91	7:00:00	15	0	23	0	0	38	0
04/30/91	8:00:00	5	0	8	0	0	13	0
04/30/91	21:00:00	14	1	18	0	1	33	3
04/30/91	22:00:00	6	0	3	0	0	9	0
05/01/91	5:00:00	4	1	5	1	2	11	18
05/01/91	6:00:00	6	0	7	1	1	14	7
05/01/91	7:00:00	1	0	20	1	1	22	5
05/01/91	8:00:00	2	0	9	0	0	11	0
05/01/91	19:00:00	7	0	5	0	0	12	0
05/01/91	20:00:00	6	0	10	0	0	16	0
05/01/91	21:00:00	9	2	10	2	4	23	17
05/01/91	22:00:00	13	3	15	0	3	31	10
05/02/91	12:00:00	19	1	15	0	1	35	3
05/02/91	13:00:00	4	0	2	1	1	7	14
05/02/91	14:00:00	5	0	3	0	0	8	0
05/02/91	15:00:00	7	1	0	0	1	8	13
05/02/91	19:00:00	6	1	7	0	1	14	7
05/02/91	20:00:00	22	2	41	1	3	66	5
05/02/91	21:00:00	26	0	13	1	1	40	3
05/02/91	22:00:00	20	3	15	0	3	38	8

Appendix Table 38.0. --(continued)

Date	Time	Chinook Not Des/Inj	Chinook Des/Inj	Steelhead Not Des/Inj	Steelhead Des/Inj	Total Des/Inj	Total Number of Fish	% Des/Inj
05/03/91	12:00:00	6	1	17	0	1	24	4
05/03/91	13:00:00	2	0	4	0	0	6	0
05/03/91	14:00:00	4	1	7	0	1	12	8
05/03/91	15:00:00	2	0	3	0	0	5	0
05/03/91	19:00:00	10	0	13	0	0	23	0
05/03/91	20:00:00	37	3	35	2	5	77	6
05/03/91	21:00:00	34	2	21	2	4	59	7
05/03/91	22:00:00	39	2	45	2	4	88	5
05/04/91	12:00:00	2	0	9	0	0	11	0
05/04/91	13:00:00	4	0	9	0	0	13	0
05/04/91	14:00:00	5	1	15	0	1	21	5
05/04/91	15:00:00	1	0	1	0	0	2	0
05/04/91	19:00:00	8	0	22	0	0	30	0
05/04/91	20:00:00	21	0	25	0	0	46	0
05/04/91	21:00:00	36	2	41	0	2	79	3
05/04/91	22:00:00	30	2	45	0	2	77	3
05/05/91	5:00:00	15	1	51	2	3	69	4
05/05/91	6:00:00	4	0	72	2	2	78	3
05/05/91	7:00:00	7	0	21	2	2	30	7
05/05/91	8:00:00	7	2	30	0	2	39	5
05/05/91	19:00:00	7	2	19	0	2	28	7
05/05/91	20:00:00	78	5	121	1	6	205	3
05/05/91	21:00:00	19	2	38	0	2	59	3
05/05/91	22:00:00	18	2	45	1	3	66	5
05/06/91	5:00:00	8	0	10	0	0	18	0
05/06/91	6:00:00	4	0	6	0	0	10	0
05/06/91	7:00:00	2	0	6	0	0	8	0
05/06/91	8:00:00	3	0	6	0	0	9	0
05/06/91	19:00:00	4	1	11	0	1	16	6
05/06/91	20:00:00	9	0	28	0	0	37	0
05/06/91	21:00:00	22	1	27	1	2	51	4
05/06/91	22:00:00	16	0	23	1	1	40	3
05/07/91	12:00:00	37	1	31	1	2	70	3
05/07/91	13:00:00	13	2	14	0	2	29	7
05/07/91	14:00:00	11	0	12	0	0	23	0
05/07/91	15:00:00	5	0	4	0	0	9	0
05/07/91	19:00:00	17	1	12	0	1	30	3
05/07/91	20:00:00	89	8	203	10	18	310	6
05/07/91	21:00:00	65	10	48	1	11	124	9
05/07/91	22:00:00	45	2	41	0	2	88	2
05/08/91	12:00:00	4	1	28	1	2	34	6
05/08/91	13:00:00	7	2	27	3	5	39	13
05/08/91	14:00:00	5	1	7	0	1	13	8
05/08/91	15:00:00	1	0	10	0	0	11	0
05/08/91	19:00:00	23	2	20	0	2	45	4
05/08/91	20:00:00	49	2	76	3	5	130	4
05/08/91	21:00:00	52	1	32	0	1	85	1
05/08/91	22:00:00	41	3	22	1	4	67	6
05/14/91	19:00:00	3	0	16	0	0	19	0
05/14/91	20:00:00	11	3	224	15	18	253	7
05/14/91	21:00:00	5	2	36	0	2	43	5
05/14/91	22:00:00	8	1	33	2	3	44	7
05/20/91	19:00:00	37	3	175	13	16	228	7
05/20/91	20:00:00	65	4	202	16	20	287	7
05/20/91	21:00:00	36	4	110	14	18	164	11
05/20/91	22:00:00	35	4	172	21	25	232	11
05/21/91	5:00:00	8	3	73	6	9	90	10
05/21/91	6:00:00	17	3	126	18	21	164	13
05/21/91	7:00:00	8	0	121	16	16	145	11
05/21/91	8:00:00	13	4	79	9	13	105	12
05/21/91	9:00:00	8	1	36	11	12	56	21
05/21/91	10:00:00	9	0	171	24	24	204	12
05/21/91	11:00:00	7	0	87	12	12	106	11
05/21/91	19:00:00	6	4	47	6	10	63	16
05/21/91	20:00:00	13	1	38	7	8	59	14
05/21/91	21:00:00	10	0	20	6	6	36	17
Total		2628	154	3824	249	403	6855	
Average per Test		17.5	1.03	25.5	1.66	2.69	45.7	4.19

Appendix Table 39.0. --Mortality of chinook and steelhead smolts during hourly tests of the PIT-tag detection/diversion system at Lower Granite Dam, 1991.

Date	Time	PIT-tagged fish			Untagged fish			Total Morts	Total Number of fish	% Morts
		Chinook	Steelhead	Total	Chinook	Steelhead	Total			
04/16/91	18:00:00	0	0	0	0	0	0	0	0	-NA-
04/16/91	19:00:00	0	0	0	0	0	0	0	3	0
04/16/91	20:00:00	0	0	0	0	0	0	0	5	0
04/16/91	21:00:00	0	0	0	0	0	0	0	12	0
04/16/91	22:00:00	0	0	0	0	0	0	0	4	0
04/17/91	19:00:00	0	0	0	0	0	0	0	2	0
04/17/91	20:00:00	0	0	0	0	0	0	0	5	0
04/17/91	21:00:00	0	0	0	0	0	0	0	7	0
04/17/91	22:00:00	0	0	0	0	0	0	0	1	0
04/17/91	23:00:00	0	0	0	0	0	0	0	1	0
04/18/91	19:00:00	0	0	0	0	0	0	0	2	0
04/18/91	20:00:00	0	0	0	0	0	0	0	13	0
04/18/91	21:00:00	0	0	0	0	0	0	0	12	0
04/18/91	22:00:00	0	0	0	0	0	0	0	6	0
04/22/91	19:00:00	0	0	0	0	0	0	0	13	0
04/22/91	20:00:00	0	0	0	0	0	0	0	17	0
04/22/91	21:00:00	0	0	0	0	0	0	0	12	0
04/22/91	22:00:00	0	0	0	0	0	0	0	7	0
04/23/91	10:00:00	0	0	0	0	0	0	0	2	0
04/23/91	11:00:00	0	0	0	0	0	0	0	3	0
04/23/91	12:00:00	0	0	0	0	0	0	0	17	0
04/23/91	13:00:00	0	0	0	0	0	0	0	11	0
04/23/91	14:00:00	0	0	0	0	0	0	0	2	0
04/23/91	15:00:00	0	0	0	0	0	0	0	5	0
04/24/91	10:00:00	0	0	0	0	0	0	0	30	0
04/24/91	12:00:00	0	0	0	0	0	0	0	15	0
04/24/91	16:00:00	0	0	0	0	0	0	0	31	0
04/25/91	12:00:00	0	0	0	0	0	0	0	10	0
04/25/91	13:00:00	0	0	0	0	0	0	0	18	0
04/25/91	14:00:00	0	0	0	0	0	0	0	17	0
04/25/91	15:00:00	0	0	0	0	0	0	0	36	0
04/25/91	19:00:00	0	0	0	0	0	0	0	12	0
04/25/91	20:00:00	0	0	0	0	0	0	0	19	0
04/25/91	21:00:00	0	0	0	0	0	0	0	15	0
04/25/91	22:00:00	0	0	0	0	0	0	0	53	0
04/26/91	12:00:00	0	0	0	0	0	0	0	16	0
04/26/91	15:00:00	0	0	0	0	0	0	0	10	0
04/26/91	19:00:00	0	0	0	0	0	0	0	12	0
04/26/91	20:00:00	0	0	0	0	0	0	0	50	0
04/26/91	21:00:00	0	0	0	0	0	0	0	37	0
04/26/91	22:00:00	0	0	0	0	0	0	0	76	0
04/27/91	12:00:00	0	0	0	0	0	0	0	15	0
04/27/91	13:00:00	0	0	0	0	0	0	0	15	0
04/27/91	14:00:00	0	0	0	0	0	0	0	20	0
04/27/91	15:00:00	0	0	0	0	0	0	0	13	0
04/27/91	19:00:00	0	0	0	0	0	0	0	24	0
04/27/91	20:00:00	0	0	0	0	0	0	0	65	0
04/27/91	21:00:00	0	0	0	0	0	0	0	67	0
04/27/91	22:00:00	0	0	0	0	0	0	0	67	0
04/28/91	12:00:00	0	0	0	0	0	0	0	33	0
04/28/91	13:00:00	0	0	0	0	0	0	0	18	0
04/28/91	14:00:00	0	0	0	0	0	0	0	33	0
04/28/91	15:00:00	0	0	0	0	0	0	0	7	0
04/28/91	19:00:00	0	0	0	0	0	0	0	63	0
04/28/91	20:00:00	0	0	0	0	0	0	0	137	0
04/28/91	21:00:00	0	0	0	0	0	0	0	40	0
04/28/91	22:00:00	0	0	0	0	0	0	0	67	0
04/29/91	12:00:00	0	0	0	0	0	0	0	20	0
04/29/91	13:00:00	0	0	0	0	0	0	0	14	0
04/29/91	14:00:00	0	0	0	0	0	0	0	16	0
04/29/91	21:00:00	0	0	0	0	0	0	0	190	0
04/29/91	22:00:00	0	0	0	0	1	1	1	66	2
04/30/91	5:00:00	0	0	0	0	0	0	0	18	0
04/30/91	6:00:00	0	0	0	0	0	0	0	38	0
04/30/91	7:00:00	0	0	0	0	0	0	0	38	0
04/30/91	8:00:00	0	0	0	0	0	0	0	13	0
04/30/91	21:00:00	0	0	0	0	0	0	0	33	0
04/30/91	22:00:00	0	0	0	0	0	0	0	9	0
05/01/91	5:00:00	0	0	0	0	0	0	0	11	0
05/01/91	6:00:00	0	0	0	0	0	0	0	14	0
05/01/91	7:00:00	0	0	0	0	0	0	0	22	0
05/01/91	8:00:00	0	0	0	0	0	0	0	11	0
05/01/91	19:00:00	0	0	0	0	0	0	0	12	0
05/01/91	20:00:00	0	0	0	0	0	0	0	16	0
05/01/91	21:00:00	0	0	0	0	0	0	0	23	0
05/01/91	22:00:00	0	0	0	0	0	0	0	31	0
05/02/91	12:00:00	0	0	0	0	0	0	0	35	0
05/02/91	13:00:00	0	0	0	0	0	0	0	7	0
05/02/91	14:00:00	0	0	0	0	0	0	0	8	0
05/02/91	15:00:00	0	0	0	0	0	0	0	8	0
05/02/91	19:00:00	0	0	0	0	0	0	0	14	0
05/02/91	20:00:00	0	0	0	0	0	0	0	66	0
05/02/91	21:00:00	0	0	0	0	0	0	0	40	0
05/02/91	22:00:00	0	0	0	0	0	0	0	38	0
05/03/91	12:00:00	0	0	0	0	0	0	0	24	0

Appendix Table 39.0. —(continued)

Date	Time	PIT-tagged fish Chinook	PIT-tagged fish Steelhead	PIT-tagged fish Total	Untagged fish Chinook	Untagged fish Steelhead	Untagged fish Total	Total Morts	Total Number of fish	% Morts
05/03/91	13:00:00	0	0	0	0	0	0	0	6	0
05/03/91	14:00:00	0	0	0	0	0	0	0	12	0
05/03/91	15:00:00	0	0	0	0	0	0	0	5	0
05/03/91	19:00:00	0	0	0	1	0	1	1	23	4
05/03/91	20:00:00	0	0	0	0	0	0	0	77	0
05/03/91	21:00:00	0	0	0	0	0	0	0	59	0
05/03/91	22:00:00	0	0	0	0	1	1	1	88	1
05/04/91	12:00:00	0	0	0	0	0	0	0	11	0
05/04/91	13:00:00	0	0	0	0	0	0	0	13	0
05/04/91	14:00:00	0	0	0	0	1	1	1	21	5
05/04/91	15:00:00	0	0	0	0	0	0	0	2	0
05/04/91	19:00:00	0	0	0	0	0	0	0	30	0
05/04/91	20:00:00	0	0	0	0	0	0	0	46	0
05/04/91	21:00:00	0	0	0	0	0	0	0	79	0
05/04/91	22:00:00	0	0	0	0	0	0	0	77	0
05/05/91	5:00:00	0	0	0	0	0	0	0	69	0
05/05/91	6:00:00	0	0	0	0	0	0	0	78	0
05/05/91	7:00:00	0	0	0	0	0	0	0	30	0
05/05/91	8:00:00	0	0	0	0	0	0	0	39	0
05/05/91	19:00:00	0	0	0	0	0	0	0	28	0
05/05/91	20:00:00	0	0	0	0	1	1	1	205	0
05/05/91	21:00:00	0	0	0	0	0	0	0	59	0
05/05/91	22:00:00	0	0	0	0	0	0	0	66	0
05/06/91	5:00:00	0	0	0	0	0	0	0	18	0
05/06/91	6:00:00	0	0	0	0	0	0	0	10	0
05/06/91	7:00:00	0	0	0	0	0	0	0	8	0
05/06/91	8:00:00	0	0	0	0	0	0	0	9	0
05/06/91	19:00:00	0	0	0	0	0	0	0	16	0
05/06/91	20:00:00	0	0	0	0	0	0	0	37	0
05/06/91	21:00:00	0	0	0	0	0	0	0	51	0
05/06/91	22:00:00	0	0	0	0	0	0	0	40	0
05/07/91	12:00:00	0	0	0	0	0	0	0	70	0
05/07/91	13:00:00	0	0	0	0	0	0	0	29	0
05/07/91	14:00:00	0	0	0	0	0	0	0	23	0
05/07/91	15:00:00	0	0	0	0	0	0	0	9	0
05/07/91	19:00:00	0	0	0	0	0	0	0	30	0
05/07/91	20:00:00	0	0	0	0	0	0	0	310	0
05/07/91	21:00:00	0	0	0	0	0	0	0	124	0
05/07/91	22:00:00	0	0	0	0	0	0	0	88	0
05/08/91	12:00:00	0	0	0	0	0	0	0	34	0
05/08/91	13:00:00	0	0	0	0	0	0	0	39	0
05/08/91	14:00:00	0	0	0	0	0	0	0	13	0
05/08/91	15:00:00	0	0	0	0	0	0	0	11	0
05/08/91	19:00:00	0	0	0	0	0	0	0	45	0
05/08/91	20:00:00	0	1	1	0	0	0	1	130	1
05/08/91	21:00:00	0	0	0	0	0	0	0	85	0
05/08/91	22:00:00	0	0	0	0	0	0	0	67	0
05/14/91	19:00:00	0	0	0	0	0	0	0	19	0
05/14/91	20:00:00	0	0	0	0	0	0	0	253	0
05/14/91	21:00:00	0	0	0	0	1	1	1	43	2
05/14/91	22:00:00	0	0	0	0	0	0	0	44	0
05/20/91	19:00:00	0	0	0	0	1	1	1	228	0
05/20/91	20:00:00	0	0	0	0	0	0	0	287	0
05/20/91	21:00:00	0	0	0	0	1	1	1	164	1
05/20/91	22:00:00	0	0	0	0	3	3	3	232	1
05/21/91	5:00:00	0	0	0	0	0	0	0	90	0
05/21/91	6:00:00	0	0	0	0	1	1	1	164	1
05/21/91	7:00:00	0	0	0	0	0	0	0	145	0
05/21/91	8:00:00	0	0	0	0	0	0	0	105	0
05/21/91	9:00:00	0	0	0	0	0	0	0	56	0
05/21/91	10:00:00	0	1	1	0	1	1	2	204	1
05/21/91	11:00:00	0	0	0	0	0	0	0	106	0
05/21/91	19:00:00	0	1	1	0	0	0	1	63	2
05/21/91	20:00:00	0	0	0	0	0	0	0	59	0
05/21/91	21:00:00	0	0	0	0	0	0	0	36	0
Totals		0	3	3	1	12	13	16	6855	
Average per test		0.0	0.0	0.0	0.0	0.0	0.0	0.1	45.7	0.13

APPENDIX 2

Scale Analysis Report

ANNUAL PROGRESS REPORT

FISH RESEARCH PROJECT
OREGON

PROJECT TITLE: A determination of the hatchery and wild ratios and selected life history characteristics from scales of transported and non-transported groups of spring chinook and steelhead in the Snake River.

CONTRACT NUMBER: 40ABNF101898

PROJECT PERIOD: May 2, 1991 to December 31, 1991.

Prepared by L.A. Borgerson

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CONTENTS

SUMMARY

Objectives for FY 1991

1. Determine the hatchery/wild ratios of transported and non-transported spring and summer chinook salmon from scales of juveniles and adults at Lower Granite Dam.

2. Determine the effects of transport on age at maturity, growth, migration timing, and other life history characteristics from scales of adult spring and summer chinook salmon and steelhead at Lower Granite Dam.

Accomplishments in FY 1991

We read and classified the hatchery or wild rearing origin of 507 spring chinook salmon and 249 summer chinook salmon. We examined scales from 28 spring chinook salmon, 20 summer chinook salmon, and 60 summer steelhead and tested for differences in life history and growth characteristics between transport and control groups.

Findings in FY 1991

We estimated that 20.1% (± 4.7%) of the spring chinook salmon and 54.6% (±7.7%) of the summer chinook salmon passing Lower Granite Dam were wild fish. We found no differences in life history, migration timing, or growth between transported and control groups of chinook salmon. We found that transportation or volitional migration may have differing effects on hatchery and wild summer steelhead.

INTRODUCTION

Since 1975 run sizes of spring and summer chinook salmon in the Snake River have decreased to historical lows with completion of Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams. The Columbia Basin Fish and Wildlife Authority has implemented a large-scale transport program in an effort to eliminate mortality of juvenile salmonids caused by dam passage. Although decisions have been made to implement transport at near maximum levels, there is a lack of definitive data on survival benefits of transporting spring chinook salmon (Matthews et al. 1990). Transport benefits for spring chinook salmon have been difficult to assess because of inadequate adult returns and unexplained variability in existing return data. This variation may be due to unknown proportions of hatchery and wild fish in the experimental transport and control samples.

In 1988, the National Marine Fisheries Service (NMFS) initiated a pilot study to assess the feasibility of using PIT tagged wild spring chinook salmon to determine transport benefits to wild fish. However due to low recovery rates (10% of fish marked) at Lower Granite Dam it was apparent that this methodology would be impractical in a large scale study due to the volume of wild fish that would have to be tagged and the high cost of the PIT tags.

Discriminant analysis (DA) of fish scale patterns is a accepted method of identifying hatchery or wild origins of salmon. Between 1978 and 1987, Oregon Department of Fish and Wildlife (ODFW) used DA to correctly classify 85-95% of hatchery and wild coho salmon caught in ocean fisheries off Oregon (Borgerson 1988). Fryer and Schwartzberg (1990) used DA to correctly classify 84-91% of hatchery and wild spring chinook salmon from the Deschutes, Wenatchee, Grand Ronde, and Imnaha rivers. DA will be used as an alternative method to estimate the wild and hatchery composition of the run-at-large as well as fish in experimental transport and control groups for the NMFS transport study.

Benefits of transport have been evaluated in terms of smolt-to-adult survival. Transport may have effects on the life history dynamics of the populations that need to be understood to fully evaluate the benefits of transport programs. It is reasonable to suspect that fish that are transported 320 miles from Lower Granite Dam to below Bonneville Dam in 1-3 days and non-transported fish that migrate volitionally the same distance in 20-60 days may differ in migration, growth and age at maturity. Park (1985) found that steelhead transported from Little Goose and Lower Granite dams returned to hatcheries later that non-transported fish.

Scale analysis will be used to determine if differences exist in growth rates, migration timing, and life history of transported and non-transported (control) groups of spring and summer chinook salmon and summer steelhead.

METHODS

Scale Preparation and Reading

Scale collection for this work involved 3 agencies and 2 tribes. Scales from the mixed stock groups of chinook salmon and steelhead from Lower Granite Dam were collected by NMFS personnel. The known origin scales used to develop the discriminant functions were collected by personnel of Idaho Department of Fish and Game, ODFW, and the Nez Perce and Umatilla tribes. We provided diagrams showing location of the key scale area (Nicholas and Van Dyke 1982) and sample procedures so all collections were sampled by the same methods.

Mixed stock spring and summer chinook salmon from Lower Granite Dam were collected proportionally throughout the run-at-large. We selected the sample size of 550 for both groups so that it would yield a 95% confidence interval that was $\pm$25% of the point estimate when the discriminant function correctly classified 85% of samples and wild fish made up 20-30% of the run. Because the run of summer chinook was less than expected we reduced the samples size to 275 to reduce impact on the fish. All summer steelhead marked for the transport study encountered at Lower Granite Dam were sampled for scales.

We mounted the scales from Lower Granite Dam on gummed cards and made acetate impressions. Scales from other locations were mounted and pressed by the collecting agency. All parties provided location, length, date, presence or absence of mark, and sex data for each sample.

We used an Apple IIc microcomputer, Altec digitizing board, and Scale Reader Program software (Mullen 1984) to measure and record scale measurements. The scale image was enlarged to 88x magnification using a microfiche reader. Measurements were made along a radius 20^0 to the anterior posterior axis on the ventral side of the scale. We made two groups of measurements; we made extensive measurements in the freshwater zone on all chinook salmon scales used for the hatchery or wild DA (Figure 1). We made a second set of measurements on the portion of the scale that represented early ocean residence and juvenile migration of all chinook salmon and summer steelhead that were marked for the transport study (Figure 2). After reading the scales, measurement data were transferred from the Apple IIc computer to an "IBM compatible" computer for computation of additional variables (Table 1) and final analysis.

Hatchery or Wild Classification of Chinook Salmon

We used discriminant analysis to classify spring and summer chinook salmon by hatchery or wild origin. For discriminant analysis to provide meaningful results the training populations used to develop the function must be representative of the groups within the unknown sample. We "weighted" scales from various streams based on the estimated contribution of fish from that stream to the overall population. For example the wild spring chinook training population was "weighted" so that 1/4 of the samples were from Oregon tributaries and 3/4 were from Idaho tributaries. Components of the hatchery training populations were weighted by release numbers from each hatchery and the survival of the hatchery group.

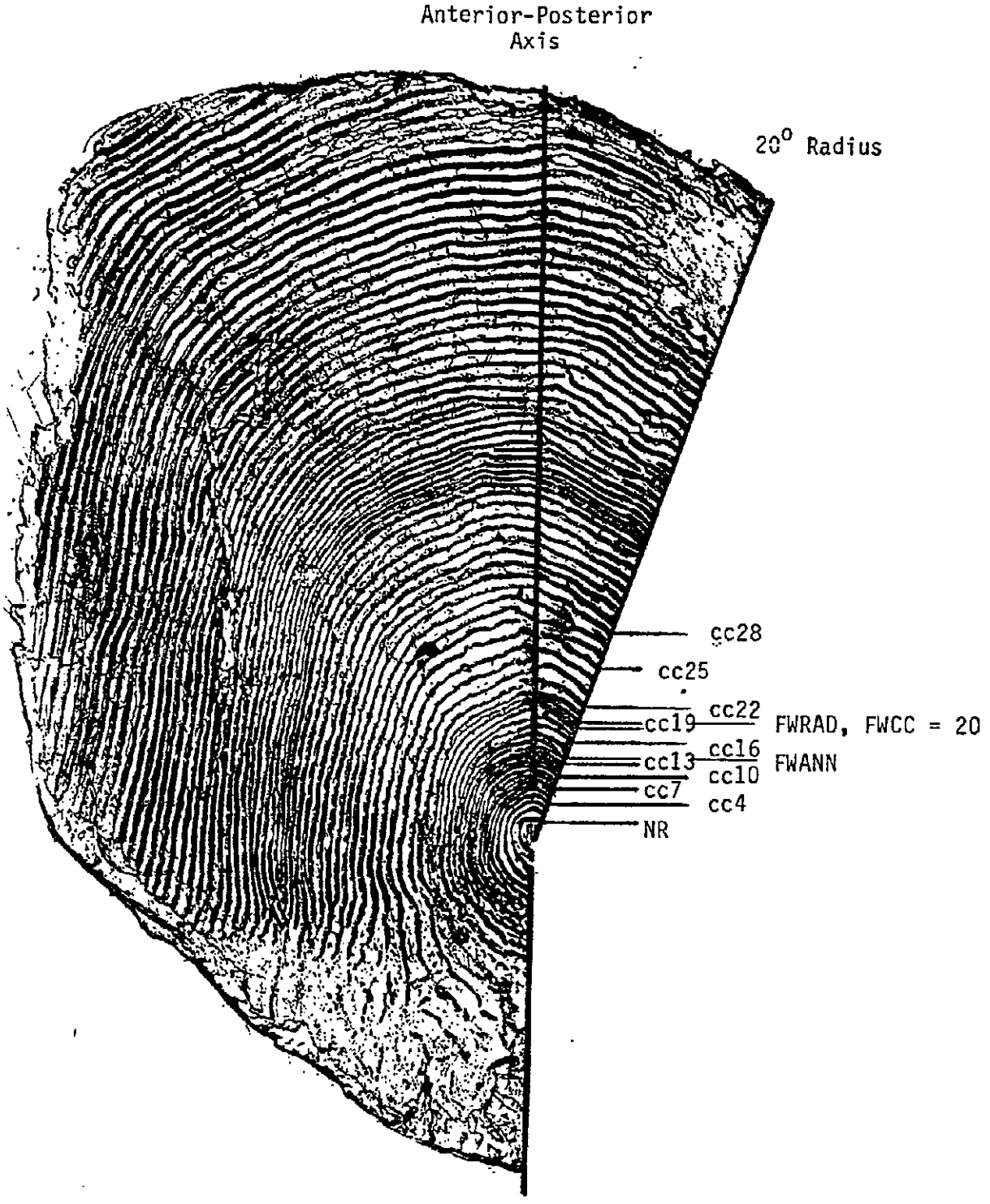

Figure 1. Measurements of scale growth used to discriminate between hatchery and wild chinook salmon. The scale is from a wild spring chinook salmon sampled in Capehorn Creek, tributary to North Fork of the Salmon River. Measurement labels are defined in Table 1.

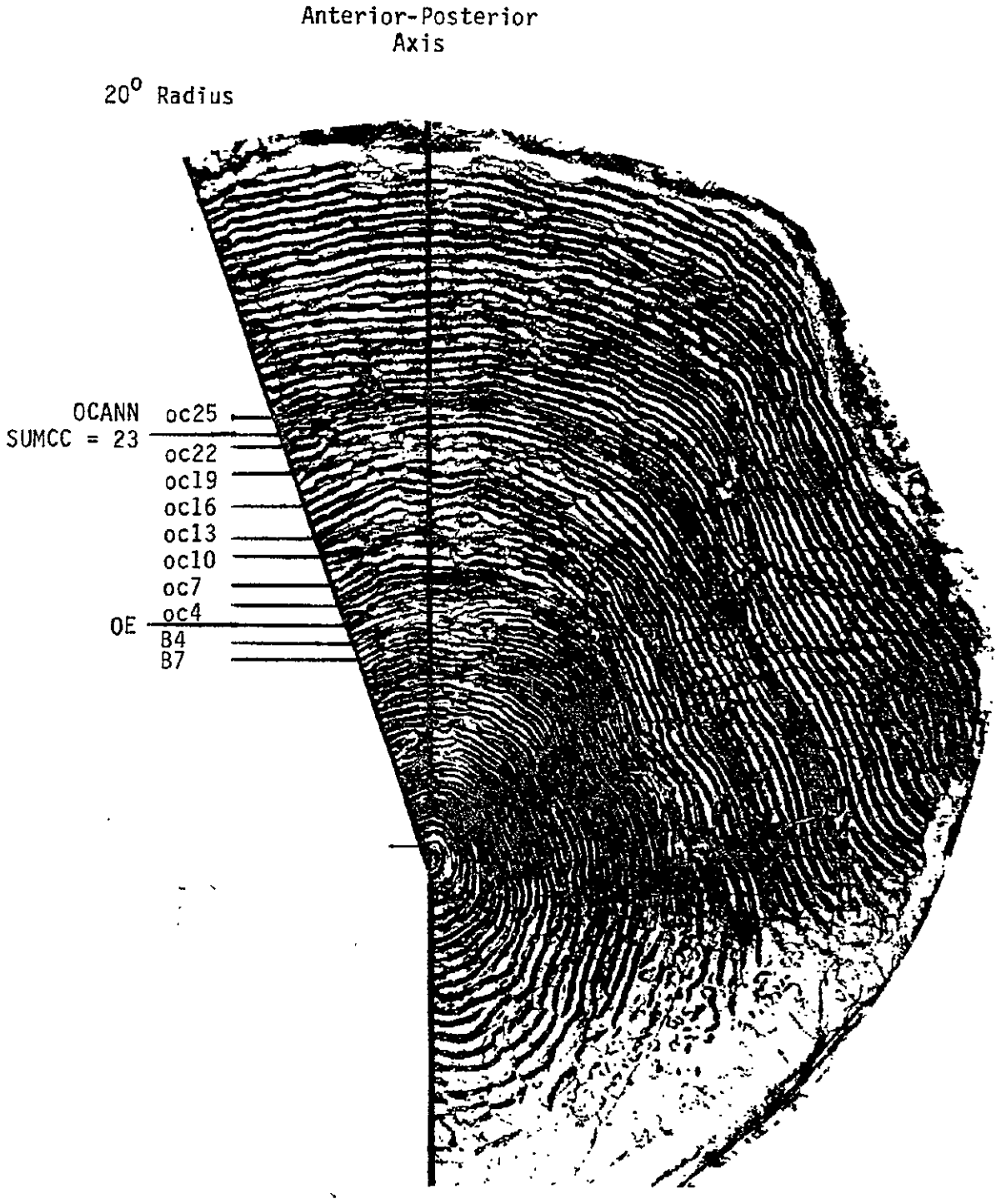

Figure 2. Measurements of scale growth that occurred during juvenile migration and early ocean residence. The scale is from a hatchery reared summer steelhead marked as part of the control group for the transport study. Measurement labels are defined in Table 1.

Table 1. Definition of scale variables read or calculated.

Variable	Definition
Read:	
FWCC	Number of circuli in the freshwater zone.
NR	Radial measurement of the nucleus, also considered circulus 1.
FWANN	Radial measurement to the winter annulus of freshwater zone.
FWRAD, OE	Radial measurement to the last circulus in the freshwater zone.
CC4-CC28	Radial measurements in 3 circuli increments between the fourth and 28th circuli of the freshwater zone.
SUMCC	Number of circuli between OE and the first annulus formed in the ocean.
OCANN	Radial measurement to the first annulus formed in the ocean.
OC4-OC25	Radial measurements in 3 circuli increments between the fourth and 25th circuli of the ocean zone.
B4	Radial measurement to the fourth circulus counted back into the freshwater zone from OE, inclusive.
B7	Radial measurement to the seventh circulus counted back into the freshwater zone from OE, inclusive.
Calculated:	
BW56	Bandwidths 5 and 6, CC19-CC13.
R1D6	Ratio of bandwidths 1 and 6, (CC4-NR)/(CC19-CC16).
JM1	OE - B4.
JM2	B4 - B7.
OR1	OC4 - OE.
OR2	OC7 - OC4.
OR3	OC10 - OC7.
OR4	OC13 - OC10.
OR5	OC16 - OC13.
OR6	OC19 - OC16.
OR7	OC22 - OC19.
OR8	OC25 - OC22.
OET	OCANN-OE.

When we did not have sufficient scales to represent certain groups at the required rate we either substituted scales from another location or, if there were not reasonable substitutes, we reduced the overall size of the training population until the limiting sample was represented at its proper weighting. Initially our goal was to have 150 scales in each training population but after adjusting for locations with low sample size we allowed the training population for wild spring chinook to drop to 88 scales (Table 2).

We developed linear discriminant functions using BMDP Statistical Software 88 Release (Dixon 1988) for spring chinook salmon and summer chinook salmon.

Table 2. Stock composition of training populations used to develop discriminant functions for classifying spring and summer chinook salmon of unknown origin.

Training population, location	Number	Percent
Spring Chinook Salmon		
Hatchery:		
Clearwater	3	2.3
Rapid River	40	30.5
Red River	6	4.6
Powell	7	5.3
Sawtooth	27	20.6
Dworshak	1	0.8
Lookingglass[a]	27	20.6
Lookingglass	20	15.3
	131	100.0
Wild:		
North Fork Salmon	53	60.2
Selway	2	2.3
Salmon	11	12.5
Grand Ronde	22	25.0
	88	100.0
Summer Chinook Salmon		
Hatchery:		
McCall	35	35.0
Pahsimeroi	37	37.0
Lookingglass	28	28.0
	100	100.0
Wild:		
South Fork Salmon	80	66.7
Imnaha	40	33.3
	120	100.0

[a] Samples used as substitutes for unavailable samples from Dworshak and Kooskia hatcheries.

Both functions classified the fish according to hatchery or wild origin. Variables were added to or removed from the function in a step-wise method based on their F values. The spring chinook function contained 2 variables (FWANN and BW56) and the summer chinook function contained 3 variables (FWANN, FWRAD, and RID6). For both functions the variable FWANN, representing fish size at the end of the winter in freshwater, was the first variable selected and was very powerful at discriminating between hatchery and wild fish.

Ideally, we would have tested the classification ability of our functions with additional sets of known origin samples but that was not possible. Instead, we estimated correct classification using the jackknife method (Efron 1982), provided by BMDP Statistical Software, as well as bootstrap and cross-validation methods (Efron and Tibshirani 1991). Results from the three methods differed by only 0.4% for spring chinook salmon, with the cross validation method yielding the most conservative estimate. Classification rates for both functions were estimated by cross-validation (Table 3).

After the mixed stock samples were classified, we corrected the results for misclassification and calculated confidence intervals using the methods of Worlund and Fredin (1962). Within the mixed stock samples were a few fish that had been marked for the transport study. We noted the percent wild within the marked transport and control groups but did not correct the estimate or calculate confidence intervals for these small subsamples.

Table 3. Two-way classification matrixes for the hatchery and wild groups of spring and summer chinook salmon.

Function, Correct group	Percent Correct	Number of fish classified into each group: Wild	Hatchery
Spring chinook salmon			
Wild	86.4	76	12
Hatchery	92.4	10	121
Overall correct classification:	90.0		
Summer chinook salmon			
Wild	91.7	110	10
Hatchery	89.0	11	89
Overall correct classification:	90.5		

Differences in Age Composition, Ocean Growth Rate, and Migration Timing Between Hatchery and Wild Fish Belonging to Experimental Transport or Control Groups

We used two-way analysis of variance on scale measurements representing ocean entrance timing and growth during juvenile migration and early ocean residence to test for significant differences ($p \leq .05$) between hatchery or wild fish that were transported or used as controls during the transport study. Chinook salmon were included in either the hatchery or wild group based on the results of the discriminant analysis. Steelhead were identified as hatchery fish by having clipped fins. All steelhead released from hatcheries in the Snake River system are fin clipped. Steelhead with no clipped fins were assumed to be wild. Chinook salmon and summer steelhead were identified as belonging to experimental transport and control groups by various freeze brands (Matthews et al. 1990).

To represent growth that occurred during early ocean residence we used measurements of circuli bands radiating out from the ocean entrance check. To represent growth that occurred in the Snake and Columbia rivers during migration, we measured two bands of circuli that immediately preceded the ocean entrance check (Figure 2). Depending on how quickly a fish migrated, these river bands may include growth from freshwater residence as well as migration.

We used the distance between the first winter annulus formed in the ocean and the ocean entrance check to index the time of ocean entrance. We assumed that the winter annulus was formed at the same time of the year for all fish so if the distance between the ocean entrance check and the annulus is large the fish had entered the ocean "early". A small distance would indicate "late" ocean entrance.

We determined the age of each fish by counting winter annuli. We used a contingency table to compare the age compositions of transport and control groups of summer steelhead but did not statistically test the age compositions of spring or summer chinook because we felt the samples sizes were too small.

RESULTS

We read 507 scales from the spring chinook salmon run passing Lower Granite Dam and estimated that 20.1% (±4.7%) were wild fish. Likewise we read 249 scales from summer chinook salmon and estimated that 54.6% (±7.7%) were wild fish. Within our samples from the spring chinook salmon run-at-large were 28 samples marked by the transport study. Of the samples marked as belonging to the control group 44.4% were classified as wild while 20.0% of the transported fish were classified as wild. There were 20 summer chinook salmon recovered from the transport study; 50.0% of control fish (n=2) and 77.8% of transported fish were classified as wild.

We found no differences in growth rates or migration timing between transported or control groups of combined spring and summer chinook salmon (Table 4). We did find significant differences between wild and hatchery chinook salmon in one variable representing growth just after ocean entrance and in the variable used as an index of ocean entrance time. Our results indicate that wild fish may enter the ocean later than hatchery fish.

Table 4. Two-way analysis of variance and group means for scale variables representing growth during juvenile migration (JM) and early ocean residence (OR), and ocean entrance timing (OET) for adult spring and summer chinook salmon from the transport study sampled at Lower Granite Dam in 1991.

Variable name	Means				Significant differences ($p < .05$)		
	Wild		Hatchery				
	Transport	Control	Transport	Control	Type	Origin	Type x origin interaction
JM1	58.9	59.8	60.4	57.4			
JM2	55.2	57.8	55.9	46.1			
OR1	87.5	95.0	100.5	101.1			
OR2	101.9	104.6	121.4	112.0		X	
OR3	100.5	109.4	109.6	105.9			
OR4	99.8	108.0	96.6	108.0			
OR5	103.9	105.0	107.1	105.9			
OR6	102.5	102.6	105.1	109.1			
OR7	99.2	97.0	99.6	102.2			
OR8	96.6	94.3	101.7	101.6			
OET	705.4	704.0	724.4	777.1		X	
Sample size	21	5	17	9			

We found significant differences between hatchery and wild summer steelhead in variables representing ocean entrance time and growth during river migration and early ocean (Table 5). Wild steelhead tended to have larger growth measurements. Our results also indicate that transportation may have different effects on time of ocean entrance for hatchery and wild summer steelhead.

We found no significant differences between the age compositions of transported and control groups of summer steelhead (X^2=6.795, p=.2363). Age compositions for spring and summer chinook salmon and summer steelhead are given in Table 6.

PLANS FOR 1992

In 1992 we plan to repeat all work accomplished in 1991. In addition we plan to determine the hatchery and wild composition of the juvenile populations of spring and summer chinook salmon for comparison to the hatchery and wild composition of the returning adults.

Table 5. Two-way analysis of variance and group means for scale variables representing growth during juvenile migration (JM) and early ocean residence (OR), and ocean entrance timing (OET) for adult summer steelhead from the transport study sampled at Lower Granite Dam in 1991.

Variable name	Means				Significant differences ($p < .05$)		
	Wild		Hatchery				
	Transport	Control	Transport	Control	Type	Origin	Type x origin interaction
JM1	68.7	63.7	64.3	65.0			
JM2	55.7	55.8	67.5	62.5		X	
OR1	92.0	96.0	84.6	97.9			
OR3	114.8	128.7	95.7	103.2		X	
OR4	104.3	126.7	94.6	99.8	X	X	
OR5	97.8	112.8	99.3	99.3			
OR6	113.7	114.8	99.2	86.4		X	
OR7	100.3	110.7	93.0	78.3		X	
OR8	92.4	99.8	81.8	66.2		X	
OET	757.3	960.7	684.3	580.1		X	X
Sample size	6	6	27	21			

Table 6. Age composition of summer steelhead, spring chinook salmon and summer chinook salmon from the transport study sampled at Lower Granite Dam in 1991.

Total age	Life history[a] (Freshwater/Marine)	Transport		Control	
		Number	Percent	Number	Percent
Summer steelhead					
3	1/1	8	22.2	4	13.3
4	1/2	16	44.4	18	60.0
4	1/3	5	13.9	0	0
4	2/1	2	5.6	1	3.3
5	2/2	3	8.3	5	16.7
6	3/2	2	5.6	2	6.7
Spring chinook salmon					
3	1/1	1	6.3	0	0.0
4	1/2	15	93.7	11	91.7
5	1/3	0	0.0	1	8.3
Summer chinook salmon					
3	1/1	7	38.9	0	0.0
4	1/2	9	50.0	2	100.0
5	1/3	2	11.1	0	0.0

[a] Number of freshwater annuli/number of ocean annuli.

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